The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. XXIX. December 23, 1933 No. 756

Notes and Comments

Financial Experiments

IT is with some diffidence that we write of the American situation. We take no credit for having pointed out the dangers of the Roosevelt policy when it was first announced. To those who are used to the sound finance of the British banking and monetary system, the State control of wages and industry seemed to be fraught with the gravest dangers. The American business men, having recovered from the panic into which they had plunged themselves before the new President came into office, are now beginning to see the dangers. The fear of inflation is causing industrial and mercantile companies feverishly to modernise their equipment, to accumulate stocks of fuel and raw materials, and in a variety of other ways to spend their surpluses to avoid the risk of allowing them to deteriorate in buying power.

A panic seems to be again spreading through American business; there is difficulty in persuading anyone to embark on new ventures, even to the extent of quite modest capital. Nevertheless, President Roosevelt refuses to be turned one hair's breadth from his purpose. Whether his resembles the courage of Nelson who applies his blind eye to the telescope, or whether it is the foolishness of the ostrich with its head in the sand, we do not yet know, though we have our ideas on the subject. If we are wrong we shall be the first to congratulate the President on having proved that in the apparently new world conditions—conditions for which the march of science must take a large measure of responsibility—the economic tenets of our ancestors are outworn and incorrect. President Roosevelt's present intention appears to be no less than to take charge of the international gold market and to force off the gold standard such countries as now remain on it.

Confidence and Stability

IT is expected, for example, that Paris cannot long stand the strain and will be forced off gold. A policy having such repercussions on the rest of the world can clearly not be any longer regarded as the private concern of the American people. If the currencies of the whole world are depreciated, it may not be bad in the long run, but that such a step, which would have a most unsettling effect upon the course of world business just when it is beginning to regain confidence, should now be contemplated must be a matter for urgent concern.

Confidence is the keystone of international trade and stability of exchanges is the essential foundation. Whatever the ultimate result of undermining these may be, the immediate result may well be a disastrous step backwards. Events seem to have justified our remark some months ago that the improvement in trade so long awaited was actually upon us and would continue *if* the American experiment did not cause unsettling repercussions throughout the rest of the world. We do not allow party politics to intrude upon our pages. Our object is the furtherance of industry and whatever party puts in its policy items that will aid that object will to that extent have our voice. It is with some dismay, therefore, that we notice nationalisation of the great banking system of the country to be among the avowed objects of the Labour party. We know too much of that party's past ideas on the subject of finance to have the slightest confidence in any such proposal from that source. Ultimately the control will be applied to the provision of funds for wildly altruistic schemes said to be for the furtherance of the well-being of the poorer classes. We are second to none in our zeal for good works, but we cannot think that measures leading to the destruction of business confidence and to the consequent paralysis of industry can ever really advantage those who earn their living by industry. This country in a peculiar degree depends upon its financial strength and soundness for its prosperity. That is why we have always eschewed financial experiments and have operated only upon the basis of experience.

Multum in Parvo

A SINGLE well-managed concern making a variety of products is in many respects a true microcosm of the whole industry. We hope and believe that this is true of the British Cyanides Co., a brief account of whose annual general meeting was given in a recent issue. The gross profit has increased by no less than 35 per cent. as compared with the previous year. This profit, moreover, has not been obtained by tightened control and economies; the general expenses, indeed, increased by 11¼ per cent. In the words of the chairman, "those expenses would increase further during the current year for there was no way of avoiding an increase in general expenses if the company was to take advantage of the opportunities of developing the business that offered themselves. However, *so long as the profits continued to increase at a rate proportionately much higher* (the italics are ours), the business would be

developing on satisfactory lines." This continued improvement in business in highly satisfactory and so also is the realisation that no penny-wise-pound-foolish policy can benefit any industrial concern. It is, perhaps, less a matter for congratulation that the expenditure upon research and patents by this particular company has decreased by 10¼ per cent.; the decrease may perhaps be illusory since it only amounts to £683 on the year, which is less than the sum required to keep a qualified research worker busy.

Chemical and physical research is not the only type of development work to be undertaken. The development of the marketing organisation, market research, and the search for new directions into which it may be found profitable for the chemical research worker to turn his energies are all just as important, and sometimes just as costly as laboratory and plant research. We have been surprised to find how little the chemical manufacturer often really knows about his markets.

A Symptom of the General Trend

THE record of development of the British Cyanides Co. is impressive and in that respect mirrors faithfully the general trend of British chemical industry. The chemical factory has been fully employed over the whole year. Demand for Beetle moulding powders has been satisfactory and increasing; the moulding shop has been further increased in size; sales of mouldings were four times what they were in 1931 for the same quarter. A new moulding process has been introduced which is both low in cost and so effective that the decoration is as permanent as the moulding itself. A lacquer resin is being developed at the request of customers. In face of all these developments it is encouraging to the industry to read the chairman's remark that "they were working on other new developments, and, indeed, the main difficulty is to choose between the many opportunities that present themselves for expansion within this new industry (*i.e.* plastics) and to keep that expansion within reasonable limits."

Finally there are to be noted arrangements, international in character, whereby valuable patents have been secured and competition avoided. There can be little doubt that the principle of avoiding competition by delimiting fields, popular as it is in certain instances, will be made more use of in the future, especially as international relationships become closer. Cut-throat competition is always to be avoided, if only because the resulting mutual impoverishment cannot advantage either manufacturers nor, ultimately, customers. Customers may reap a temporary advantage in cheap goods, but since the manufacturers have to spend in meeting competition money that should be invested in new plant and development, the customer is deprived of improved products and new types of goods that he might otherwise have secured.

The Sampling Problem

LAST week we commented on the Fuel Research Board paper on the accuracy of routine analytical determinations on coal and coke and applied its lessons to the importance of accuracy in the chemical works. In our consideration of this aspect let us not ignore the greatest uncertainty of all—that of sampling. The accuracy of the analysis means nothing if it is greater than the accuracy of the sampling. If this rule were rigidly applied, many analyses that we now express to two places of decimals, would be given to the nearest 1 per cent. This aspect of works chemistry demands more careful consideration. On a large works there should be a sampling department, consisting of chemists of proved perspicuity under a senior of experience. Some materials can be sampled with a high degree of accuracy; many can be sampled only with great difficulty. Who, for example, would care to ascertain the correct moisture content of 100 tons of coke, or the correct ash of a bay full of pitch collected from different tars? Yet the analytical limits of accuracy according to the Fuel Research Board's publication are of the order of 0.045 per cent. for moisture in coke and 0.035 per cent. for ash in coal (with which pitch may be compared). The difficulty of sampling is generally avoided in a peculiar manner accepted by both parties with their eyes shut. "A" sample is taken, and the results of this adventitious fraction of the whole is accepted by the seller. The buyer does the same at his end. If the two fail to agree both parties agree to pay someone else to repeat the whole procedure and to accept his verdict. It is more than doubtful whether that verdict means anything in many instances, but honour is satisfied! In practice, of course, the samples frequently do not agree, and failure to call in a third party merely means that the buyer's sample has turned out better than the seller's and he thinks he has the better part of the bargain!

Noise and Rubber

IT is one of our pet fancies that every works should aim at noiseless operation. We feel that noise is detrimental alike to the human brain and to the efficiency of the machine. Noise can only be produced by the expenditure of energy, and represents energy in the wrong place. Misplaced energy is wasteful in efficiency and is liable to cause damage to the machine. The use of rubber for the elimination of noise is quite well known, but is not applied so frequently as we could wish. The use of rubber covered plant has made striking advance in recent years in many industries. It has, for example, been applied to the coating of conveyors and screens; rubber belt conveyors in place of all-metal bucket conveyors are quite common to-day. These applications have not been promoted by the desire to decrease noise, but to obtain increased efficiency and longer life for the plant. There is, however, a movement to use rubber definitely to reduce noise. At the exhibition recently held by the India Rubber, Gutta Percha, and Telegraph Works, Co., Ltd., it was stated as an example that the motor industry was a notable example of what had been done to eliminate noise. In a motor-car rubber was used to counteract noise to an extent never dreamed of a few years ago. There were the rubber suspension to the engine, and rubber packings for the doors, windows, frames and springs. Yet the application of rubber to the car seemed to be still in its infancy. The latest device for noise prevention is a covering for the metal framework of trays and baskets used by the dairy industry. We feel that there may be something here in which the chemical industry might well interest itself.

The Chemist as a Directing Force in Industry

Dr. Herbert Levinstein's Gluckstein Memorial Lecture

THERE can be no better general training for industry, not only for the chemical industry, than a sound training in science, said Dr. Levinstein. Too few in this country have had such a training, too few of our business men, of our politicians, and especially too few of our civil servants. The notable exceptions but emphasise the justice of this view. We need not doubt that a young man, if he is to succeed, must have many qualities that cannot be supplied by training; mere knowledge or talent is not enough. Ludwig Mond, Alfred Nobel and Ernest Solvay did not succeed merely because they were good chemists or had inventive genius. They were resolute men with great powers of work, with constructive imagination and business ability. It is one thing to make an invention, quite another to build up a successful business organisation by developing an invention industrially. The dyestuff firms before the big amalgamations took place did far more research work and employed more chemists than all the other chemical firms put together. Yet, even the dyestuff firms were not all either founded or controlled by chemists. Meister, of Lucius and Brüning, was at one time a Manchester merchant. Heinrich Böttinger, an old Cheltonian, was at the head of Forbenfabriken Vormals Friederich Bayer and Co. A man of great energy, he was on the commercial side and travelled a great deal in developing sales. Thus, when the direct dyes were discovered and put on the market, he founded schools for the native dyers in India, to teach them how to use them. That is how ½ lb. or 1 lb. tins of very dilute Congo Red, with fancy labels, became so important an export. His successor, Dr. Duisberg, also a son-in-law of F. Bayer, commenced his business career in the research laboratory, where he distinguished himself. Then he became a plant manager, then manager of the factory, and so, by the classical route so familiar in the chemical industry, especially in Germany, to the head of the undertaking.

These two instances suffice to show that it is not necessary to be a chemist to control even a dyestuff manufacturing business. It is merely a great advantage to be one. It has been found sufficient to have enough chemical knowledge to use chemists wisely, or a flair for choosing and using research results profitably.

A scientific training for business men of all kinds and for politicians and civil servants was advocated by Dr. Herbert Levinstein, in delivering the Gluckstein Memorial Lecture at the Institute of Chemistry, in London, on December 15.

Success in Plant Management

Quite a small number of people in any walk of life have creative gifts or a capacity for original thought or inventive talent. This is as true of those who take up chemistry and pass their examinations successfully as of all other people. Those chemists who have a genius for research, or if not a genius a passion for research, will not desire to administer a factory nor to control a business. Sir William Perkin did not want to run a factory after he had made enough money to be able to spend his life in the pursuit of pure science. The factory chemist is not recruited from such as these, but often chemists drift into the management of an industrial plant or into administrative work. Where many chemists are employed the newcomer usually first goes into the research department. This is an excellent practice. In this way the research department is kept in constant touch with the latest methods of university laboratories, and the young chemist can acquire the factory outlook. It is usually considered to be a promotion to be selected from the research department for a position in the works, and the transference is, therefore, welcomed.

Success in managing a plant leads finally to an administrative position. Thus, many of us who prefer to spend our time in research are tempted from the laboratory. Men seldom return to the laboratory if they make good on the plant. Responsibilities grow quickly with success and administrative work accumulates and gradually these twin destroyers win them, not without regret, from a scientific career.

Young men who have a bent for factory work are now receiving admirable post-graduate training in chemical engineering. A graduate of our youngest kindred institute, the Institution of Chemical Engineers, from the first aspires to be the constructor of plants or the manager of a factory. Practical experience is their aim, and when they have the chance to get it, they grasp it without any regrets. The specialised analytical training possessed by many Associates of the Institute of Chemistry is by no means a bad preparation for industry in general. Accurate work, clear thinking and close observation are qualities of universal value, but routine analyses mechanically carried out lead nowhere. A chemical training is varied but always gives an excellent preparation for many jobs. More than that it cannot do. What can be accomplished later in life as a force in industry depends on the individual or upon the opportunities that he can find or make. An increasing number of people who have had this training are being employed as administrators in the big chemical and other industries. But there is no indication whatever that politicians, financiers and bankers—the classes which carry most weight in this country—are making the slightest progress in this direction. Finance houses and banks might well consider whether it would not be useful to take into their employment as a routine procedure men thoroughly trained in chemical industry. We have too little "educated money" in this country. The money lords are inclined to distrust new methods and to leave the development of new processes to the foreigner.

From Laboratory to Works

We stipulate, after taking a degree, that the young chemist should spend one or two years at the university in carrying out guided research. This is to teach technique. How else can this be learnt? Why do we desire that the young chemist should not go into the works after this academic training until he has passed through the works research laboratory? Because the young chemist can thus learn the specialised methods of the particular industry, and the industrial aspect of chemical work in general. To select a subject suitable for a paper to be published in the Journal of the Chemical Society is very different from choosing work satisfactory to an industrial concern. Firms employ chemists only because it pays them so to do, and the kind of things that pay have got to be learnt. The training afforded by plant work is self-evident.

A laboratory discovery that appears to have technical merit must be worked out in the laboratory very carefully before it is ripe for a large scale. You must understand the reaction much more thoroughly than is necessary in the university laboratory before transplanting. You have to become the master of the process, not merely to supply a recipe. You have to review methodically every single difference that may arise between the small scale methods and those possible on a large scale, and to determine their effect, singly and collectively. Then a preliminary costing will have been made. As the result you may have to design a plant or help to design a plant, together with the engineer. The plant must not be merely a plant that will produce the product required. That is comparatively simple. One has to design the cheapest, simplest, and as nearly standard a plant as possible which will do the work and yet not lose yield or production.

If the market survey shows that the product may be required in large quantities one must consider the question of raw materials. It is well to recall the history of artificial indigo from the classical researches of Baeyer to the ultimate

factory process. Thus the process that required ortho-nitrotoluene as the principal raw material was obviously unsuitable for really large production because of the formation of the para isomer. The method that depended on naphthalene was not as desirable as that which had benzene as a basis. If a product is to be supplied on a large scale provision must be made for obtaining the raw material on the requisite scale. In time of war the use of raw material, except for war purposes, may be restricted, and the chemist may have to find other raw materials.

The plant must be capable, with due allowance for errors, of making the quantity required: it must cost approximately the estimated sum, and should be ready at the proper time. Lastly, the staff and labour required must be properly calculated and if necessary trained so that when the plant is finished the personnel is also ready. Such considerations are quite elementary. No technologist would ask his board for an appropriation of the necessary capital without weighing them up. They form part of the training of the chemical engineer or works director. It is difficult to make any new substance successfully on a large scale, but to overcome these difficulties is the routine work of a technologist.

The American Debt Agreement

Politicians, economists and bankers are perhaps too much inclined to regard inventions as accidental. Often they do not fully appreciate that inventions are in truth created by researches directed to a specific purpose by trained minds. They are not aware of the processes through which every invention passes in a well-conducted organisation before it is approved for manufacture on a large scale and before the new invention takes its place on the markets of the world. There are occasions when economists forget that the amount of a substance produced is not an accident, but that it is determined by the demands of trade, by the capital available, by the profits to be made, and often by the raw material supply. Thus the production of any commodity in the world is seldom the maximum possible. It is always the maximum which appears to be commercially expedient.

Give attention for one moment to the neglect of these considerations by those responsible for the payment of gold to the United States on account of war debts. The production of fine gold in South Africa is an industry very like any other large manufacturing industry It requires a great deal of capital. At the time of the debt settlement the nominal capital of the South African mines amounted to about £50,000,000, roughly the cost of carrying on the war for ten days. It employed 200,000 people, of whom less than 10,000 were white. Like every other industry, the gold mines of South Africa regulate their production of gold according to the demand which they can profitably supply.

Gold Production

We agreed to pay America a large quantity of gold annually. In round figures, the share of Great Britain amounted to £30,000,000 or 220 metric tons per year. This gold was taken from stock. No effort was made to manufacture the extra quantity required from the raw material available in plenty, nor to ear-mark any portion of the new production of gold for the debt payment, nor to limit in any way the use of gold for unnecessary purposes. In every particular we failed to take the elementary precautions which a trained technologist would have taken had he been called upon to advise.

In the nine years from 1923 to 1931, 4,300 metric tons of gold were shipped to America in payment of war debts. What America did with this gold, for good or for bad, wisely or unwisely, does not really matter. The greater part of 4,300 tons was physically removed from the Treasuries where it had previously reposed. There it had supported currency or credit, had given confidence and security in accordance with old-established practice. After it had been taken away, it was not returned. How could this be done without causing a collapse of currencies, of trade and the prices of primary commodities such as we have witnessed? Yet no concerted attempt was made to increase the production of gold. Not one step was taken to manufacture the goods, the delivery of which had been promised.

What should we think in business of a sales department which made contracts to deliver without consulting their manufacturing side, nor even the research department, who neglected to do every one of those things that are elementary in any properly conducted business?

If we had arranged to pay our indemnity to America in bricks, in many ways a more useful commodity than gold, we should have found the stocks inadequate. Should we have pulled down our houses to supply the bricks? No. We would have opened up new brick fields wherever raw materials were to be found and no doubt at first rationed the bricks that could be used for non-essential building in our country. This is precisely the reverse of what was done by our politicians and those advising them in the matter of sending gold.

For this reason it is most advisable for more men who have had a scientific training and have been through the industrial mill, to take their place in the Civil Service, in public life and in the direction of industry. Every chemist, unless he is one of the exceptional beings who have a genius for pure science, should be a man of commonsense who can use his training to solve ordinary problems of life, public or private. In every business concern a man accustomed to making new things and to be responsible for their cost and their due production should be invaluable.

Political Changes and Industry

All political or social changes in one nation react remarkably quickly on all others. People are badly off all over the world and they quickly react to new social theories, which spread like forest fires throughout the world. Apart from this, if the industries of one or two important States can act as a unit a similar concentration or simplification in some form or other will be forced upon us. Already one or two measures forcing compulsory quota and compulsory marketing methods have passed through this Parliament. We have recently begun a series of trade agreements with other countries, which must soon lead to quite novel restrictions on the construction of new plants. If the State arranges for a certain quota of a British product to be taken by another State as part of a reciprocal undertaking, it is clear that the agreement of the trade as a whole must be obtained first. If the trade as a whole accept a plan with a view to helping in a general scheme it must be protected from newcomers. Acceptance of a quota, either at home or abroad, under pressure from the State, must, therefore, logically involve an undertaking from the State that new firms shall not be free to start up and manufacture as soon as the ink is dry on the national agreement.

The consequences are of great importance to chemists. Up to now any person making an invention has been free to erect a plant to carry out his invention. A man has been free to carry out on a large scale the manufacture of any chemical that he liked, unless the product or process was patented by somebody else. It may in future be necessary for inventors or enterprising individuals who wish to be their own masters to obtain a permit from the Board of Trade before they can be allowed to build.

Cheerful Trade Returns

Satisfaction for Everybody

COMMENTING on the Board of Trade Returns published last week. "The Independent" says: "The returns of our overseas trade for November maintain and continue the cheerful story of the recent past. Substantial increases in both imports and exports indicate that trade barriers are failing in their purpose to set up one-way traffic. The figures lend themselves, like all figures, to a variety of arguments, but the arguments must be of a congratulatory kind; the latest returns give a minimum of opportunity to the grumbler or pessimist. If we deal in percentages, then imports improve by 3½ per cent. and exports are better by 10 per cent. If we are interested in the 'adverse balance' theory, it is less on the month by £1,100,000. The increase in exports is three times the total increase of the previous 10 months. Look at it how we will, November sea-borne trade must give a considerable measure of satisfaction to everybody."

Bread and Milk

Professor H. E. Armstrong's Views on the Recent Symposium

THE informed and statesmanlike address by Professor Kay on "The Improvement of the Nation's Milk Supply" and the brief challenging and suggestive note on "The Value of Yeast in Bread," by Dr. Eyre, prevent this conference from being an abortive attempt to deal with issues of the gravest public concern, otherwise there has been very little Bread, not much Milk, only "an intolerable deal of Sack," in the form of matter, however valuable in itself, irrelevant to the real purpose of the conference, which I assume was to take stock of two root components of our national dietary—Bread and Milk. The Food Group is the most important section of the Society of Chemical Industry—because it is the most public! All other sections may be said to be mainly, if not entirely, of industrial consequence—to be concerned with the internal efficiency and trade interests of the industries they represent. The Food Group can only be of use if it subordinate trade interests and consider without fear or favour those of the public at large. I have discussed this issue with the chairman of the Group and find, as I could only expect to find, that his attitude is one of complete scientific detachment; his view, like mine, being that, in the long run, in all matters pertaining to food, the interests of the trade are the interests of the public.

Apart from the fourteen papers presented at the meetings, no report has apparently yet been issued of the symposium on "Bread and Milk" held by the Food Group of the Society of Chemical Industry in London last month. Professor H. E. Armstrong has, however, favoured us with these notes, with which he closed the discussion at the session over which he presided.

I make the point advisedly. Is it not a fact, to-day, that nearly all trade interests are publicly suspect—especially the flour and bread and milk trades? The public know that they are not getting what they ought to have from these; that a mad race for dividends, not public health and well-being, is their primary lodestar.

The root cause of our difficulty is—that we will not learn to know. So-called scientific method has no place in our political system. Think of the composition of our Government, of the House of Commons, of the Government Departments, especially of the Ministries of Agriculture and Health; of the unimaginative and often uninformed utterances of politicians of all shades of opinion. Science was not represented on the Milk Marketing Board. When an Agricultural Research Committee is appointed, it consists all but entirely of persons untrained in research, little likely to pursue a constructive policy.

Milk Falls between Two Stools

Milk has fallen between two stools—quality does not come into account in the Milk Marketing Scheme and when a Food Standards Committee is appointed, milk is put out of bounds. Of what good is a Society of Public Analysts or even this Food Group, if they suffer such things? The bishops and medical men are out only to cure sins; they make no constructive effort to prevent their first incidence. With bell and book, the bishops are cursing beer, when they should be advocating the cause of bread and milk. The medical profession is bent on studying tubercular disease to its last bovine bacillus but does nothing to study non-medical means of prevention; it knows nothing of chemistry; it is only concerned with curing disease, not with preventing it—there is no money in prevention. We should not need a tithe of the present number of medical men, if we once learnt to feed ourselves properly—with proper bread and milk, etc. In fact, all social forces, including the great public itself, are united in one huge conspiracy against public well-being. The Board of Education, led by Sir George Newman, starts the race; in a book for teachers, giving lessons in hygiene, which it has issued, ten pages are devoted to abuse of alcohol, one only to damning milk with the faintest of praise, nothing being said of the lack of virtue in bread. These, not vitamins nor bacteria, are the problems to be considered by the Food Group, the main one being how to inform those who presume to govern us. The whole problem is political. Suppose we put disarmament aside; cut Geneva and its intrigues; leave Germany to develop the ethics of *The Ring*; let the U.S.A. strip off all its gilt and glitter; ourselves devoting our whole attention to the infinitely difficult task of crawling upon our own bellies. If we do not, the next generation will not have the guts in it to fight anyone. Our disarmament will be complete. My technical qualification to speak on food may be a very slight one, in no way comparable with that of the young biochemists, maybe straight from Gowland Hopkins's lectures, who now sacrifice their one-time domestic pets upon what they are misled into thinking is the altar of science, having themselves learnt little of common salt and nothing of water. The curse of underdone, underfed chemistry weighs heavily, at present, upon this Group. The real work has all been done, either by trained clinicians or by competent chemists. Gowland Hopkins is a medical man with a flair for chemistry, who has had the genius to train himself as a chemist, a naturalist to wit; the Auxin work was begun by a trained botanist, completed by a highly skilled chemist.

My experience dates back only 66 years, to 1866, when I began the study of sewage matter in our domestic water supplies. I learnt something in the act; the work eventually served to rid this country of typhoid as an endemic disease, incidentally banishing cholera from London. Frankland and I were no biochemists; we were already definitely *abiotic*, in pre-Pasteurian, pre-Listerian times.

About 15 years later, I began a synthetic inquiry from which I learnt not a little—the production of a family of seven. I knowingly and advisedly took the risk of bringing them all up, from birth, on raw, ordinary milk. Their frail appearance is more or less known in the Group. As the males have not yet learnt to appear in shorts, they afford no direct evidence—those who have seen them on the bathing beach, I believe, have no fault to find with their limbs. As to the females, public opinion, I think, will bring no charge of rickets against their visible limbs. I may add that they never had cod liver oil, though in early days, as the cod still carried its liver, it came to their aid naturally; they have only needed an occasional dose from the castor bean. They have been exceptionally free from illness. My philosophy of life is summed up in three words: Damn the Drugs. Face the Bugs (the bacteria).

The True Temperance Society

Having satisfied myself that school education, as dictated to the country mainly from Oxford, is an entire failure, in recent years I have joined the True Temperance Society and have written for them a tract, "In Search of Truth of Alcohol"; in reality a nature-study syllabus written around John Barleycorn.

I have dedicated this to the service of the Butler Mitchell Birmingham Pubs, the Savile and Savage Clubs, Sunday and other schools. I end by saying "I seem to see in the pub the future centre of mass scientific inquiry and intelligence." I say this in all seriousness. I have made a special study of the Birmingham pubs. They are worthy of every and all the citizens—but they are empty houses at present, owing to your failure to make proper provision for their service. They are not to be thought of as beer houses alone—but as houses for true bodily refreshment with sound belly food, as well as mental food. Recently, I went down as a missionary, to Birmingham, from the True Temperance

Society. I was received with open arms by the Brewers' Guild, but University and Press took not the slightest notice. Brummagem, like most cities, if not all, is in a state of heathendom in these matters; Joseph Chamberlain himself never got beyond housing; belly filling was not in his programme.

My message to the brewers was—the pubs lack beer fit to drink, you have lost your old industry, you have been taxed out of it, your old art is gone; science has killed it. You have to develop a new industry, to learn to make light beers, bearing distinctive names, worth drinking in the homes of the intelligent masses—the pubs.

Then I had to confess to a serious failure. I urged that the pub should set the example of good cookery and supply food fit to eat, as the beer should be fit to drink. I had to confess that neither the bread nor the milk on sale was worthy to be dispensed from their counters. Here the Food Group comes in.

After what has been said, no word is needed from me in further complaint of the low average quality of milk. As to bread, again the case needs no argument. It is unfit food for the masses at large, who cannot supplement its deficiencies. As witness, we need take only the wheat grain itself—consider the great variety in its diet and that we throw out from the flour practically all the natural mineral nutrients and we know not what besides.

In the Hands of the Ignorant

Gentlemen of the Food Group—the production of bread and milk has hitherto been left entirely in the hands of ignorant people; of persons who have considered quantity and profit but never quality, as we now understand it. They are not entirely to blame—our knowledge of food values is so recent.

Not one word can be said in extenuation of the crime committed by biologists, by medical men generally, by the Medical Officers of Health, especially by the Board of Agriculture and in later years by the Ministry of Health. That a representative of this Ministry should lament here the state of the cowshed throughout the country is only a proof of the callous indifference of officialdom. Fifty years ago, after Frankland had shown what was the condition of our water supply and had led the way to the provision of a safe water supply, a similar crusade should and might have been begun on behalf of milk *and the whole system put right within a dozen years.* Shame upon us all that we have to confess to such dereliction of our public duty.

I have said the problem is one for political solution. The next election must be fought, in the cause of labour, on a ticket of sound money—a standard of value, of sound education, of sound food. It is no question of reforming the House of Lords, but of reconstructing the houses that fail to make the Lords and the Commons too, of public value—the public schools and Oxford. We have to abolish the worship of the words and substitute the recognition of facts.

It is clear that there must be a large measure of socialisation, at an early date, if we are to make use of our knowledge in the production of sound food. Farmers are naturally too conservative in disposition to react sufficiently quickly. They must be helped over their stiles. A radical reform of our agricultural system must be brought about.

Enough of Pasteur and His Followers

We have had enough of Pasteur and of his followers, who shy at every organism they either see or cultivate into existence. We need to put aside the microscope—as I once heard Ruskin lament; it brings things too near. Just feed the brutes instead—the soil, the beast, ourselves. We can already assert that if we do this, we shall escape zymotic disease in large part. Listen to the following passage from the address delivered by Mr. Howard, at the Royal Society of Arts, describing the method he has developed in India of systematically converting all farm waste into manure.

"I should like to take this opportunity of drawing the attention of workers on the diseases of animals in this country to the results of more than 20 years' experience in India on the effects of the quality of the food of oxen on the incidence of epidemic disease. At three centres—Pusa in the Indo-Gantic plain, Quetta on the North-West Frontier and Indore on the black cotton soils of Central India—I was compelled by circumstances to raise the food of the work cattle in my charge by intensive methods from a small area. During this period I worked with four breeds of oxen—Khari, Gujerati, Sibi and Malvi—and utilised at all three centres 30 pairs of animals in all. The most careful attention was paid to the quality of food and to the general hygiene, but in no case were any of the animals ever inoculated against the various diseases. On the contrary, they were allowed to mix freely with and to share the pastures of all kinds of infected stock. Nevertheless, not a single case of disease occurred notwithstanding the many epidemics of foot and mouth disease, rinderpest, septicaemia and so forth, which frequently swept over the locality. I should not be surprised to find that similar results can be obtained in this country. We appear to be tackling such things as foot and mouth disease and bovine tuberculosis at the wrong end. Something is almost certain to be wrong with the food of our stock and possibly with the general hygiene as well."

Secret of Proper Feeding

We have Sir Robert McCarrison's systematic experimental inquiries carried out, on a very large scale, over a long period, showing that animals, if properly fed, remain free from disease. We have the evidence of the health of properly fed native Indian hill tribes. We have the fact that, in Lewis and the Western Isles, the cattle are free from tuberculosis disease while human tuberculosis is rife there; the cattle live in the open, the treatment we apply to ourselves. The experience in Finland is similar.

Mr. Ramsay Macdonald must be alive to the fact that his countrymen are now miserably fed: no longer upon brose; only upon white bread, margarine, marmalade and tinned salmon—practically no greens. He once all but wore the scientific mantle and it cannot have entirely slipped from his shoulders. He should be able to appreciate the situation and the need of turning our faces away from others towards ourselves and of feeding ourselves sufficiently well to face the dangers of the future. Let him stop the importation of flour and only allow that of grain, which we can grind to a whole meal flour.

Out of sheer funk and to hide their neglect of duty, the authorities generally are now all counselling Pasteurisation of milk— it is the line of least resistance but a policy of despair. If adopted, it will put the clock back indefinitely. There will be no urge, not merely to cleanliness but to quality. In drinking good milk, we defend ourselves, if we do not render ourselves entirely immune to the attack of the organisms it carries. If cows were properly fed they would not harbour organisms.

Ignorance of Vested Interests

To conclude, fully conscious of the gravity of the situation, taking into account the growth of knowledge during my lifetime, knowing a little chemistry, my final and considered opinion is that if the Government were to make Pasteurisation compulsory, they would be guilty of a criminal act, equivalent to that of ordering the castration of all males as a means of preventing prostitution. An end would be put to progress in the production of food fit for the maintenance of a whole people. The task most worthy of a National Government is now to frame a scientific agricultural policy for the nation which will give us the food we might have but do not get to-day, because of the ignorance of the vested interests and the failure of scientific workers generally to make themselves heard. May this conference have shown that some of us have a voice.

Electrolysis of Water Under Pressure

A NEW high pressure electrolyser of the Druckzersetzer-G.m.b.H., of Berlin, constructed by H. Niederreither operates under a pressure of 100 to 200 atmospheres and delivers hydrogen in 99.9 per cent. purity. According to a statement by the company, which has acquired the patents, experimental data, etc., of the liquidated Lawaczek G.m.b.H., the plant functions under constant pressure and presents certain advantages over the so-called variable pressure apparatus. At 0° C. and 760 mm. the energy consumption for each cubic metre of hydrogen and 0.5 cubic metre of oxygen amounts to 4.94 kilowatt-hours. The plant now running at the company's experimental station at Munich is capable of an hourly output of 3 to 4 cubic metres of hydrogen and 1.5 to 2 cubic metres of oxygen.

Recovery of Sulphur from Coal Gas

With Special Reference to the Thylox Process

By PROTEUS

THE editorial comment in THE CHEMICAL AGE of August 26 concerning the production of sulphur by the gas and coking industry has aroused considerable interest in several quarters,[1] so that the subject seems worthy of some reflections. As the requirements of Great Britain for sulphur in various forms are mostly covered by foreign imports, the admonition of the Editor to render the country independent of supplies from abroad, deserves every support. Unfortunately, potential sources of home supplies are limited. The production of sulphuric acid, which in 1932 amounted to 784,800 tons of 100 per cent. acid absorbs by far the largest quantity of sulphur, viz., about 260,000 tons per annum on the basis of the production of acid during 1932. About 22 per cent. of this demand is met by gasworks and coke ovens which produce by-product sulphur in the form of spent purifying material (in 1932, 129,200 tons containing about 45 per cent. of sulphur).

The quantity available for this source depends entirely on the amount of gas purified and its sulphur content. Gasworks and coke ovens carbonised in 1932, 31 million tons of coal, which on the basis of 9 lb. of sulphur per ton of coal, could have yielded 125,000 tons of sulphur instead of the 58,000 tons actually recovered.

Production Below Potential Yield

The production remains below the potential yield, as only a certain portion of the gas produced by coke ovens is purified, so that the output of sulphur by gasworks and coke ovens falls short of the possible maximum amount by about 67,000 tons. There is no inducement to remove hydrogen sulphide from gas, as none of the existing methods of purification produces a net revenue. Consequently, gas is only subjected to purification if the consumer is willing to pay for this treatment, as in the case of gas delivered by gas undertakings to private consumers. The iron and steel industry uses unpurified gas like the coke ovens themselves.

Although spent purifying material is mostly consumed without further treatment in the manufacture of sulphuric acid, elementary sulphur can be extracted from it by the one or the other of the existing processes. If this were done, the whole of Great Britain's imports of sulphur, amounting to 60 to 70 thousand tons annually, could be replaced by a home product. It has been suggested by Dr. Foxwell[2] that the carbonising industry would find this market a profitable outlet for sulphur, particularly if it were produced by a direct process, instead of being extracted from the spent purifying material. The question is of more than passing interest and deserves a closer examination, particularly in view of the growing popularity of liquid gas purifying processes in America and on the Continent, among which the Thylox process of the American Koppers Co. has attracted considerable attention.

Gas Purification Employing Oxide of Iron

When coal gas was first introduced, the hydrogen sulphide was removed by milk of lime according to the method practised by Clegg. Later hydrated lime in powder form was adopted and remained in use in England, until the sulphur clause of the Gas Referees was rescinded. Neither of these processes yielded by-products of any value. For this reason Laming introduced in 1865 an artificial purifying material, the active agent of which was precipitated iron oxide. The Continent took up the idea eagerly and later employed natural iron ores (bog ore) and artificial iron oxides (*e.g.*, Lux), which are now almost universally used for the purification of coal gas and other gases. The spent purifying material has a mark value depending on its content of cyanides and of sulphur. The process is simple and efficiently removes practically 100 per cent. of the hydrogen sulphide contained in the gas and most of the hydrogen cyanide. No fundamental change has been made since the inception of the process, although certain modifications of plant design and the study of the reactions involved have tended to reduce capital and process costs. These have been given by the Area Gas Supply Committee for a moderately sized plant as shown in Table I.

These costs must be regarded as very conservative, as they are generally much lower both with regard to capital charges and operating costs, although the value of the sulphur is only 3d. per unit to-day instead of the 5d. assumed in the statement.

TABLE I.

	Operating costs. Pence per 1,000 cu. ft.	Pence per therm.
Purifying material: 1,000 tons per annum at 30s. per ton	0.30	0.060
Labour:		
Unloading new material / Loading spent material } 6d. per ton	0.01	—
Discharging purifiers / Charging of Purifiers }	0.10	0.022
Sundry Materials: £50 per annum	0.01	0.006
Supervision: £100 per annum	0.02	
Total	0.44	0.088
Deduct:		
Value of spent Oxide: 40,000 units of sulphur at 2d.	0.07	0.014
Net operating costs	0.37	0.074

Total Cost of Purification.

	Pence per 1,000 c. ft.	Pence per therm.
Operating costs	0.37	0.074
Capital charges at 12 per cent. on capital of £20,000	0.48	0.096
Total	0.85	0.170

Tower Purifiers

Recent innovations in oxide purification, which constitute a noteworthy advance in the design of purifiers and the means of reducing the cost of installation and operation, are the Lenze tower purifiers, which are in operation at the Thyssen Gas and Wasserwerke at Hamborn and Alsdorf, Germany. The plant at Hamborn has been designed in six units, each dealing with 300,000 cu. m. (1,062,000 cu. ft.) per day. A unit consists of four mild-steel towers of circular section 5.9 m. (19½ ft.) dia. and 16 m. (15½ ft.) high. Each tower contains fourteen baskets, which are filled with the purifying material. These are placed in the tower and removed from it by a 30 ton bridge crane of 22.5 m. (74¼ ft.) span. The baskets are designed so that they form a central tube for the distribution of the gas entering the purifier, whilst their polygonal shape leaves a space between the baskets and the shell of the tower for the collection of the purified gas. All baskets are charged and discharged in the revivifying sheds. A gang of four men is constantly employed and obviates the necessity of drafting periodical labour for the charging of the purifier, which is the usual practice. The plant at Alsdorf is of half the capacity, but is similar in design. The advantages claimed for the plant are:—(1) low capital cost, for a plant dealing with approximately 63½ million cu. ft. per day, the capital cost is £79,500, compared with £116,000 for the usual type of oxide purifiers; (2) low operating costs, which for the above-mentioned quantity of gas are given as £515 per annum, compared with £1,914 per annum for a plant of usual design; (3) the ground space required is about one-quarter of the usual superficial area and amounts to 21,240 sq. ft. for tower scrubbers, compared with 86,540 sq. ft. with the usual type of purifiers; (4) ease of levelling in the case of ground subsidence; (5) the small number of changes necessary before the purifying material becomes completely spent.

Spent purifying material contains 40 to 50 per cent. of sulphur and complex iron cyanides belonging to the group of ferro-cyanides in addition to iron oxide, water, organic

[1] Letters to Editor, THE CHEMICAL AGE, Sept. 9, Sept. 16, and Dec. 9, 1933.

[2] Letter to Editor, THE CHEMICAL AGE, Sept. 16, 1933.

material, such as wood fibre, sawdust, etc. As the concentration of the cyanide compounds is of the order of 4 to 8 per cent. (expressed as Prussian Blue), it is usually too low to render their extraction profitable under present market conditions. The value of the spent oxide is therefore determined by the conditions of the sulphuric acid market, which absorbs most of it. The current price is about 3d. per unit, or £1 5s. per ton of sulphur, as compared with about £5 per ton for imported American or Sicilian sulphur. In view of the advantage to be gained for marketing elementary sulphur, a number of processes(3) have been devised for the purpose of recovering the sulphur from spent purifying material in this form.

Use of Organic Solvents

Among organic solvents, success has been attained with carbon bi-sulphide, notwithstanding its many disadvantages, such as inflammability, high volatility and the relatively low solubility of sulphur, when the process is operated at atmospheric pressure. Both the solubility of sulphur and its rate of extraction can be considerably increased by working under pressure, whereby the capacity of the plant is also increased and its cost correspondingly reduced. Apparently, however, technical reasons and considerations of safety have prevented the adoption of pressures above that of the atmosphere (they would be of the order of 60 to 70 lb. per sq. in.). Many of the disadvantages adhering to the use of carbon bi-sulphide can be removed by employing other solvents, such as solvent naphtha (boiling point 160° to 170°C.), light tar oils or tetralin (boiling point 207°C.), but most of these solvents are difficult to remove completely from the extracted material, on account of their high boiling points. Notwithstanding the high solubility of sulphur in tetralin (50 per cent. at 102°C.) this solvent suffers from certain drawbacks, such as loss of material due to de-hydrogenation during re-distillation, which must take place from time to time to remove dissolved tar. Benzol has many advantages over carbon bi-sulphide, but owing to the low solubility of sulphur at atmospheric pressure (15 per cent.) pressure extraction is desirable, leading again to complicated plant. None of these solvents, therefore, has found application, so that carbon bi-sulphide is practically the only material used on the practical scale.

The margin between the market price of extracted sulphur of a grade, which is at least equivalent to grade 3 of Sicilian sulphur, and its value in spent purifying material is such that it covers the cost of extraction and purification (where this should be necessary) and leaves a substantial profit. The present price of this sulphur, therefore, can be taken at £5 per ton and that of sulphur in the form of purifying material at £1 5s. per ton, so that a balance of £3 10s. is left for the cost of recovery and profit.

Although the introduction of a sulphur recovery plant for spent purifying material would greatly enhance the revenue from the spent oxide, it hardly seems possible that the process would become self-supporting, so that also other gas than that which is distributed to the public will be purified from hydrogen sulphide. Whilst it is improbable that the amount of sulphur producible at home should increase, for the reasons stated, a national duty can be performed if all or most of the sulphur imported from abroad would be provided by the carbonising industry.

A considerable number of processes have been devised for the purification of gases from hydrogen sulphide with the object of simplifying and cheapening the operation. Although the efforts made to replace the current methods of purification, employing oxide of iron, extend over many years, most of them have failed after short periods, whilst others are operated in relatively small numbers. The different types of processes evolved can be placed in two main categories: (1) those which attempt no recovery of the sulphur in the gas; (2) those which convert the hydrogen sulphide into marketable products. The processes have been reviewed from time to time(5).

The Thylox Process

The Thylox process(5) has been developed by the Koppers Co. at Pittsburgh, U.S.A., for purification of coal gas from hydrogen sulphide with the direct production of marketable sulphur in finely divided form for agricultural purposes (fungicide) or as fused sulphur. At the same time hydrogen sulphide is extracted from the gas and obtained as sodium thiocyanate, which is recoverable on large plants. The process efficiencies reach 98 and 100 per cent. respectively. Incidentally about 70 per cent. of the organic sulphur compounds (CS_2) are also extracted. A number of plants have been in successful operation in the United States for a number of years, treating over 40 million cu. ft. of gas per day. In Europe the first installation was erected at the Ilsede Iron and Steel Works, near Hanover, in 1931, and has a capacity of 8½ million cu. ft. of gas per day. Since that date other plants have been installed in the Ruhr, one of which has a capacity of 19½ million cu. ft. of gas per day, being capable of an extension up to 32 million cu. ft. per day.(6)

The Reactions Involved

Hydrogen sulphide and cyanide are extracted from the gas with a slightly alkaline solution of arsenic, containing ¾ per cent. arsenic trioxide and a corresponding amount of sodium carbonate or its equivalent of ammonia, which on account of its present low cost is used in the latest plants. The chemistry of the process is not absolutely certain, and many formulae have been put forward for the process. The following equations are believed to represent fairly accurately the reactions involved. The solution contains in the first place sodium arsenate (equation 1), which in contact with hydrogen sulphide is converted into sodium hydrogen thioarsenate (equation 2). This is later oxidised to the thio-oxy-arsenate (equation 3), which absorbs a further molecule of hydrogen sulphide (equation 4). These two reactions go on simultaneously during the absorption process.

By oxidation of the thio-oxy-arsenate (equation 5), sulphur is liberated. This is filtered off, whilst the filtrate goes back to the process. About 80 per cent. of the sulphur contained in the gas as hydrogen sulphide is thus recovered.

The hydrogen cyanide absorbed during the washing process uses up the balance in forming sodium thiocyanate (equation 6). Owing to the accumulation of these salts, a certain portion of the liquid in circulation is removed periodically and is replaced by fresh solution.

The extraction of carbon bisulphide depends largely on its hydrolysis by the alkaline liquor, when hydrogen sulphide is produced, which is absorbed with the rest (equation 7).

REACTIONS:

(1) $As_2O_3 + 2Na_2CO_3 + H_2O = 2Na_2H\,AsO_3 + 2CO_2$

(2) $Na_2H\,AsO_3 + 2H_2S = Na_2H\,AsS_2O + 2H_2O$

(3) $Na_2H\,AsS_2O + \frac{1}{2}O_2 = Na_2H\,AsS_2O_2$

(4) $Na_2H\,AsS_2O_2 + H_2S = N.H\,AsS_2O + H_2O$

(5) $Na_2H\,AsS_2O + \frac{1}{2}O_2 = Na_2H\,AsS_2O_2 + S$

(6) $2HCN + Na_2CO_3 + 2H_2S + O_2 = 2NaCNS + CO_2 + 3H_2O$

(7) $CS_2 + 2H_2O = 2H_2S + CO_2$

Operation of Process

The plant is shown diagrammatically in Fig. 1. It usually follows the benzol washers, but experience has shown that the presence of benzol does not interfere with the reactions so that the plant can be placed before or after the benzol washers as desired. The untreated gas enters the Thylox washer, a tower scrubber, where it meets the descending stream of Thylox solution. The spent solution runs into a receiver, where it is heated to 95°F., the temperature found most suitabe for the subsequent regeneration of the solution. Various types of regenerators (called thionisers) are used. The latest form consists of a tall steel tower, in which the spent Thylox solution is treated with a large volume of air considerably in excess of the theoretical requirements for the liberation of sulphur. Both air and solution enter the tower at the bottom and rise upwards. The sulphur, which is obtained in a finely divided form,

(3) A review of current methods is given in Brennstoff-Chemie 1932, *13*, pp. 201-209.

(4) International Handbook of the By-product Coking Industry, by W. Gluud, London, 1932, Ernest Benn, Ltd. "The Gas Engineer," 1933, pp. 493-496. The Inst. of Gas Engineers, Reports (1-3) of the Ammonia Sub-Committee.

(5) Dr. Jacobson, "Gas Age Record," May 4, 1929. Kopper's Uitterlungen, 1931, *13*, p. 35. Blome, Stahl und Eisen, 1932, *52*, p. 706. Koch, Stahl und Eisen, Dec. 1933.

(6) Private communication of Heinrich Koppers, Ltd., Essen.

is separated by flotation from the rest of the solution. As the separation is not quite complete some of the spent liquor is returned direct to the absorber in order to dissolve the sulphur remaining suspended in the solution leaving the thioniser. The sulphur sludge obtained is collected in a receiver and thence passes to vacuum filters, where its moisture content is reduced to 40—50 per cent. The sulphur paste thus produced is fused with steam, either in open vessels or in autoclaves and cast into moulds. By this process the sulphur is purified, a purity of 99.5 to 99.9 per cent.

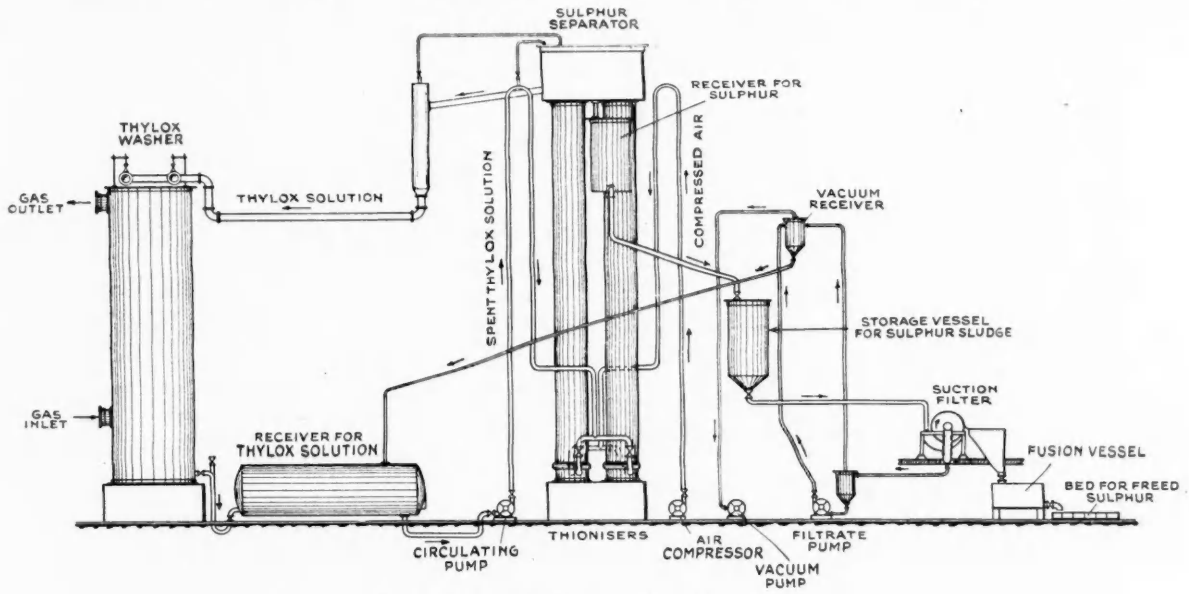

Fig. 1.—Diagrammatic Illustration of the Thylox Process.

being obtained. Although it contains a small amount of arsenic and possesses a slight smell, resulting from organic compounds in the gas, it has a good colour and is equivalent to the Sicilian and American (rock) natural sulphur of at least 2nd quality. By distillation, a pure sulphur of 99.9 to 100 per cent. *free from arsenic* can be obtained.

The filtered solution contains sodium thiosulphate and sodium thiocyanate and a certain amount of arsenic and other sulphides. It finds a ready market as weed killer and is sold as such in large quantities to railway companies, etc. A certain loss of arsenic is inevitable which is largely avoided, when the solution is regenerated. Apart from arsenic, sodium or ammonium sulphate or thiosulphate and thiocyanate is recovered. The recovery, however, is only practical on large plants.

Process Results and Costs

The process efficiency is up to 98 per cent. in the case of hydrogen sulphide, whilst it reaches 100 per cent. for hydrogen cyanide. About 80 per cent. of the total sulphur present in the gas as hydrogen sulphide is obtained as marketable sulphur. The raw materials used are principally arsenic and soda ash, the consumption of which varies from 0.01 to 0.025 lb. per thousand cu. ft. with regard to arsenic and 0.06 to 0.12 lb. per thousand cu. ft. in the case of soda. As instead of the latter ammonia is now being used, which at the present state of the market has practically no value, the process has been considerably cheapened, although there is no evidence as yet that it is self-supporting as Dr. Schmalenbach suggests.[7] Among the process costs these items are small, when compared with the cost of power, steam and labour given in Table IV.[8] As 0.507 cents (about 0.304d. at the standard rate of exchange) per 1,000 cu. ft. of gas, when allowance for the recovered sulphur is made, a net cost of 0.25 cents (0.15d.) per 1,000 cu. ft. remains.

(7) Letter to Editor, THE CHEMICAL AGE, Dec. 9, 1933.
(8) Chem. and Met. Engineering, 1933, *40*, p. 398.

The capital charges are of the same order as for oxide purifying plants, when the capacity of the plant exceeds 3½ million cu. ft. of gas per 24 hours. For very large plants the capital cost is lower. For a 3½ million plant the capital charges would be then the same as those given in Table I, viz., 0.48 per thousand cu. ft. Although this charge must be regarded as somewhat high, the comparison between an oxide and a Thylox plant is not affected. In the case of the Thylox process the cost of secondary purification must be added. This is usually 25 per cent. of the total cost of purification, so that 0.21d. per thousand cu. ft. of gas treated must be added to the operating cost given in Table II.

TABLE II.

ESTIMATED OPERATING COST ON AMMONIA-THYLOX PROCESS PURIFYING 3,500,000 cu. ft. OF COAL GAS PER DAY.
Based on 95 per cent. removal from gas containing 350 grains H_2S, and 70 grains HCN per 100 cu. ft.

Item.	Dollars per day.	Cents per 1,000 cu. ft.
Labour—12 man-hr./day at 50 c./hr.	6.00	0.172
Arsenic—0.01 lb./M. cu. ft. at 4 c./lb.	1.40	0.040
Ammonia—0.07 lb./M. cu. ft. at 0 c./lb.	0.00	0.000
Soda Ash—0.00 lb./M. cu. ft. at 0 c./lb.	0.00	0.000
Power—0.08 kw.-hr./M. cu. ft. at 1.25 c./kw.-hr. ..	3.50	0.100
Steam—For air compressor (live) 11,750 lb./day at 30 c./M. lb.	3.50	0.100
For solution heating (exhaust) 3 lb./M. cu. ft. at 15 c./M. lb.	1.60	0.045
Maintenance—0.05 c./M. lb.	1.75	0.050
Total gross operating cost	17.75	0.507
Less credit for brimstone—1,000 lb./day at $18/ton ..	9.00	0.257
Total net operating cost	$8.75	0.250 c.

The total cost of purification by the Thylox process would then be as follows:—

Capital charges	0.48d. per 1,000 cu. ft.
Net operating costs of process ...	0.15d.
Cost of secondary purification ...	0.21d.
Total	0.84d.

This figure is of the same order as that given in Table I. The Thylox process seems to have doubtful prospects of replacing the present method of purification practised by the gas industry, particularly in view of the fact that its cost can be materially reduced by extracting the sulphur from the spent purifying material and by marketing it as such. There is no reason why the Thylox process should not find application in cases where the demand for the purity of gas is not so high as for town's gas. The economy of the process improves rapidly with decreasing efficiency, so that the revenue from the recovered sulphur may cover the process costs under certain operating conditions.

Chemical Matters in Parliament

British Celanese Works

IN the House of Commons on December 13, Mr. Emrys-Evans (Derby, Southern) asked the Home Secretary whether he had yet received a report on the cause of the deaths of five workmen at the British Celanese Works at Spondon.

In reply, Sir J. Gilmour said investigations were actively proceeding, but they might take some time as difficult medical and technical questions were raised..

Mr. T. Williams asked it the Home Secretary could say whether a decision had yet been reached in regard to compensation.

Sir J. Gilmour: I must have notice of that question.

Ocean Island (Pacific Phosphate Co., Ltd.)

On December 13, Major Milner (Leeds, South-East) asked the Secretary of State for the Colonies on what terms the concession to export the guano phosphates from Ocean Island was held by the concessionaire company before it was bought out; what profits accrued to the shareholders during the latest year for which statistics are available; what amounts were paid out of the profits during that period to the Gilbert Island treasury and the natives of Ocean Island respectively, whether in royalties or in rent; and on what terms native labourers were now employed to dig and ship the phosphates, and whether they enjoyed any Government protection.

In reply, Sir P. Cunliffe-Lister said the licence granted in 1902 to the Pacific Phosphate Co., Ltd., provided for a royalty of 6d. per ton upon all exports of guano and other fertilising substances. From 1912 onwards the company paid an additional royalty of 6d. per ton for a trust fund to be used in the interests of the islanders. Particulars of the profits made or distributed by the company, whose operations were not confined to Ocean Island, are not on record in the Colonial Office. The native labourers on Ocean Island, in common with other British subjects, enjoyed full Government protection. He did not know the actual wages to the native labourers, but there was a minimum rate fixed by law.

Beet Sugar Subsidy

On December 14, Mr. T. Williams (York, West Riding, Don Valley) asked the Minister of Agriculture what proportion of the £37,440,000 subsidy and revenue abatement granted to the beet-sugar industry was received by producers of beet-sugar; and what proportion went to beet-sugar factory owners.

In reply, Mr. Elliot said the subsidy was paid, and the revenue abatement was granted, to manufacturers of sugar produced from home-grown beets. The extent to which the grower participates in this assistance was determined by the price he received for his beets. Any apportionment of the figure of £37,440,000 between factories and growers would be highly speculative, since, to arrive at the growers' share, it would be necessary to estimate what would have been the beet price in each year of the subsidy period had no assistance been afforded to the home-grown sugar industry. During the nine years 1924-25 to 1932-33 the total sum paid for beets amounted to 59 per cent. of the income derived by the factory companies from all beet products, after deducting selling expenses and Excise duty, but including subsidy and revenue abatement.

Mr. Williams: May I ask what was the original capital of the beet-sugar factories, what their reserves are now, and what dividends are paid?

Mr. Elliot: Not without notice.

Mr. Thorne: Is it not a fact that the subsidy paid is more than double the amount of the wages paid to the workmen?

Hydrogenation in Germany

On December 14, Mr. L. Smith (Sheffield, Hallam) asked the Secretary for Mines if he was now in a position to state what had been the results of the commercial hydrogenation of coal in Germany; and what was the present output and protection given.

In reply, Mr. E. Brown said inquiries which had been made indicated that the first plant on a commercial scale for operating the hydrogenation process was erected by the I.G. Farbenindustrie at Leuna in 1926, and commenced operating in 1927 on brown coal or lignite. This material was used until 1929 when, for a time, it was found more economic to utilise tars obtained by the low temperature carbonisation of brown coal, and still later to include also indigenous crude petroleum. In 1932 brown coal was again used directly as a raw material for the hydrogenation process. He had been furnished by Imperial Chemical Industries, Ltd., with information on the authority of I.G. Farbenindustrie which indicated that the production at Leuna had during the past 12 months, been between 100,000 to 120,00 tons of petrol per annum, 25,000 tons being obtained directly from brown coal and the balance from crude petroleum, tar, etc. The experience of Imperial Chemical Industries, Ltd., was that bituminous coal was technically a better raw material than brown coal, and I.G. Farbenindustrie agreed that many bituminous coals were as satisfactory as the brown coals they were using, and which they hoped to make their major raw material. In commercial enterprise, other factors had to be taken into account besides the purely technical amenability of the coals; and the proximity of the already existing I.G. Farbenindustrie works to the very large German brown coal deposits was, it was understood, one of the main reasons for the establishment of their hydrogenation plant to operate on this material. Information from official sources indicated that the preference granted to petrol produced from indigenous materials had varied from time to time. The present rate of Customs duty on petrol imported was 17RM. per 100 kg. In assessing duty the weight of containers was included in the case of petrol imported in cans, and in the case of bulk supplies the duty was increased by 25 per cent. or 29 per cent. according to the density of the petrol. This would give a total rate of duty on bulk supplies of 21.25RM., or 21.93RM. per 100 kg. The present Excise duty was 3.8RM. per 100 kg. The present rate of preference was thus 17.45RM., or 18.12RM. per 100 kg.

Insulin

On December 19, Dr. Howitt (Reading) asked the Lord President of the Council if he would direct the Medical Research Council to investigate and report upon the possibilities of the manufacture of insulin under licence and its cheaper supply in this country.

The Lord President of the Council (Mr. Baldwin) said he understood that the production of insulin had been brought to a high state of efficiency, not least in this country, and that insulin of British manufacture was available to the public here at a small fraction of the original price of ten years ago. He was advised that there was no present prospect of scientific research leading to further material decrease in the economic cost of production. As there were no longer any patent rights in the process, licences in this particular respect were not required by manufacturers.

Sir Francis Fremantle (Hertford, St. Albans): Is it not a fact that British insulin is being sold at 2s. per 100, and that the foreign price is 1s.5d. with the prospect that it would come down to 1s. 3d. if the tax were removed?

Mr. Baldwin: I should require notice of any question as to price.

Wing-Commander James (for Dr. O. Donovan, Stepney, Mile End) asked the President of the Board of Trade if in view of the recent decision to limit the importation of insulin, he would inquire into and inform the House as to the present position of the manufacture of insulin in this country.

In reply, Mr. Runciman said he understood that British makers had for some time supplied a large part of the home demand for insulin and maintained a considerable export trade; that they now had large stocks; and that their output could be readily increased if necessary.

THE Soc. An. du. Djebel-Hallouf is reported to be producing bromine at Zarsis Saline Lake, located in southern Tunisia. Bromine was produced at this site during the world war, somewhat over 1,000 tons having been recovered in the 18 months ended December, 1918. Potash is also produced in small commercial supplies at Zarsis Lake.

The Dyestuffs (Import Regulation) Bill

Debate on the Second Reading

THE principal object of the Dyestuffs (Import Regulation) Bill, which was introduced by Mr. Walter Runciman in the House of Commons last week, is to make permanent the Dyestuffs (Import Regulation) Act, 1920, which has been renewed from time to time under the Expiring Laws Continuance Acts. The second clause defines the goods the import of which is to be prohibited, as follows: (a) Synthetic organic dyestuffs (including pigment dyestuffs), whether soluble or insoluble; (b) compounds, preparations and articles manufactured from any such dyestuffs, except any such compounds, preparations and articles as are not suitable for use in dyeing; and (c) organic intermediate products used in the manufacture of any such dyestuffs.

For the purpose of advising the Board of Trade with respect to the efficient and economical development of the dye-making industry, a committee is to be constituted consisting of the members of the present advisory committee, together with persons to be appointed by the Board, representing (a) the textile industry, (b) the heavy chemical industry, (c) chemical science, and (d) any Government Department which appears to the Board to be specially concerned with such development. The representative of chemical science must be a person recommended by the Committee of the Privy Council for Scientific and Industrial Research.

Clause 4 provides that where a representation is made to the Import Duties Advisory Committee by any representative of consumers in substantial quantities of any of the goods specified in the Act, that the interests of consumers of those goods are unduly prejudiced by the prices charged or sought to be charged therefor, it shall be the duty of the Import Duties Advisory Committee to consider the representation and to make a report thereon to the Board of Trade, and the Board shall, as soon as may be after receipt of a report made under this clause, lay the report before both Houses of Parliament. The Import Duties Advisory Committee may for the purposes of this section exercise any powers conferred on them by the Import Duties Act, 1932, for the purposes of that Act.

Government's Reason for the Bill

The second reading of the Bill was taken in the House of Commons on December 18.

Dr. E. L. BURGIN (Parliamentary Secretary to the Board of Trade) said there were special reasons why a flourishing and successful dyestuffs industry was particularly important in this country. It was important for the purposes of organic chemistry in relation to industry. It was important, too, for purposes of research and keeping in touch with users' requirements, and also in connection with the use of our great coal reserves and the distillation of coal. The dyestuffs industry provided the raw material for the textile trades, and it was essential for the purposes of national defence. In 1913 the output of synthetic dyestuffs in this country was only a little over nine million pounds weight. By 1922 it had risen to over 23 million pounds, while in 1929 it was about 55 million pounds. In 1913 only 22 per cent. of our consumption of synthetic dyestuffs was made in this country. In 1922 the percentage had risen to 79, and from 1928 onwards the percentage had increased to something like 91. Our imports of synthetic dyestuffs had fallen from 41 million pounds weight in 1913 to only about four million pounds weight in 1932. In 1913 practically no intermediaries were made in this country. In 1932 only one per cent. of the intermediaries used was imported.

Dyes for Artificial Silk

In the matter of research a notable achievement had been the discovery of a range of dyestuffs for the dyeing of artificial silk, in the development of which British industry was playing a great part. There was also going on the development of specialised plant for use in the manufacture and use of these dyestuffs.

Before the war, Dr. Burgin continued, the average price of dyestuffs was about 1s. a lb. In 1920 it went up to 4s. 4d. a lb. By 1928, owing to increased manufacture, the price had fallen to 1s. 6½d. a lb., or only one and a half times the pre-war price. Conditions, he pointed out, had greatly changed in recent years, and there was now no reason why, if a case were made out, the restrictions now proposed should not be imposed. On the Continent they had vast chemical establishments making dyestuffs, and the peculiar feature of their development was that they had productive capacity more than sufficient for the entire world's requirements. In this country we had a number of small dyestuff makers who were rendering invaluable service to the consumers by making specialised dyestuffs to meet some particular requirement. It was clear that if they lowered the tariff wall and exposed the country to the importation of the surplus capacity of the Continent of Europe the first to go to the wall would be these small makers, who were incapable of resistance when dealing with these great trust and vast organisations.

The Import Duties Advisory Committee said that in their view there must be prohibition, that importation must be merely by licence, and that these licences could be granted only when it was shown that the whole country could not make the article required. The immediate effect of broadcasting the consumers' requirements of a particular dyestuff would be to put British chemists on their mettle to produce something of the kind required. In view of the fact that conflicting advice had been tendered by a committee representing the dyestuffs industry, the Chancellor of the Exchequer invited the Import Duties Advisory Committee to report on the whole matter, and it was in accordance with the recommendations of the committee that the Bill had been prepared, with some slight administrative changes based on the experience of the department. It was proposed to make the policy a permanent one.

The International Cartel

With regard to the International Cartel, this was a great organisation for a sensible pooling of markets by the interests concerned, and, provided the consumer did not suffer, was an admirable arrangement. The prices were increased 22½ per cent. when the agreement came into operation. The Import Duties Advisory Committee gave it as their considered opinion that there was nothing in that agreement which gave an undue advantage to the manufacturer. Further, no one at present was expressing dissatisfaction with the prices charged under it. At present any apprehension was merely a fear, and it was suggested that the committee were adequate for dealing with that.

The Bill now before the House had been prepared and brought forward before the House had been told of any further recommendations by the Advisory Committee as to the way they proposed to carry out their recommendations.

"I am now in a position to announce to the House the nature of the Committee's further recommendations," Dr. Burgin said. "The Treasury will issue orders bringing into effect immediately the tariff changes recommended by the committee. Those changes will come into force on December 22, and will consist of the removal of dyestuffs to the free list, and the imposition of additional duties, making the duty 20 per cent. in all on pigments which are synthetic organic colours or colouring matters. Most or all of the other materials from which the prohibition is now being removed are already subject to additional duties—that is under the Safeguarding and other Acts. The Board of Trade are giving notice that they are issuing an open general licence, with effect from December 27, for the importation of compounds, preparations, and articles not suitable for use in dyeing manufactured from synthetic or organic dyestuffs. These are the colours and colouring matters which the Committee recommended should not be subject to prohibition."

Dr. Burgin added that the joint committee of makers and users to consider the questions relating to prices and supplies had not yet been set up, but would be early in the new year. This would be a committee set up by the trade, and not by the Board of Trade.

Mr. RHYS DAVIES (Westhoughton) moved the rejection of the Bill. The Cartel, he said, included the German firm known as I.G., and also the I.C.I. He wished to know whether I.C.I. had any arrangement with the I.G. to determine the prices of dyes exported from Germany to this country. The people mainly interested in the dye question, so far as the opposition to the Bill was concerned, were the colour users. The mere establishment of a monopoly in this country for the manufacture of dyestuffs had put on the colour users a burden which they should never have been called on to bear. They complained they had been exploited by the manufacturers, and they had never admitted for a moment that the policy of the Government was anything but detrimental to their interests.

The Case of the Colour Users

Mr. H. HOLDSWORTH (Bradford, South) said that when the original Act was introduced it was said definitely to be "for ten years and no longer," and even since the end of that period the colour users had opposed the continuance of the measure. He did not see why the Government should have accepted the recommendation of the Advisory Committee in this matter and rejected the recommendation of the Dyestuffs Development Committee, which had been studying the subject for 13 years. The colour users, by their co-operation, had helped to build up the British dyemaking industry. They had willingly made heavy sacrifices by paying very much more for their raw materials since the Act came into force in 1920. They were now of opinion that the British industry was well established, and that it no longer needed the protection of prohibition of imports. For a period of twelve or thirteen years the textile trade had made tremendous sacrifices in order that an efficient dyes industry could be built up, and he thought the time had come when dye users should be treated with fairness. The best thing for the textile trade would be an open market and freedom from restrictions.

Lieut.-Commander F. W. ASTBURY (Salford, West) held that the prohibition of dye imports had been a burden on the cotton trade in Lancashire, and that there was no need for its existence. He would like to know if the I.C.I. in this country were selling colours to Japan cheaper than they were selling in this country.

Dr. BURGIN, replying to Lieut.-Commander Astbury, said the answer was in the negative.

Sir PERCY HARRIS (Bethnal Green) stressed the case of the dye users who, he declared, had not had a fair deal because of the cumbersome system of licensing which prevailed. For thirteen years, he said, they had put up with this inconvenience, and not a single argument had been produced against their case and in favour of the privileged position occupied by others. The policy being followed by the country was merely an exploitation of foreign markets. The world was to be divided up between the various powerful interests.

Imperial Defence

"These patriotic people," Sir Percy declared, "have been encouraged to produce chemicals to defend our nation against invasion and for the purposes of Imperial defence, and have now made convenient domestic cartel arrangements with an unscrupulous German combine, who, we are assured, if they were allowed to increase in our country would set out to ruin by dumping the whole of our trade." This was not a matter of Free Trade or Protection, he continued. Before the House passed the Bill they should know something more about the agreement between the British manufacturers and this German combine. This was a breach of trust between the Government and the Lancashire textile trade.

Sir H. SAMUEL (Darwen) said not one speech had been made from any quarter of the House in favour of the Bill. Producers demanded the Bill, and the consumers—the Colour Users' Association—opposed it. The Government, as usual, came down on the side of the producers. It was deliberately raising the prices of one of the most essential raw materials of the cotton industry of Lancashire.

Dr. BURGIN, replying to the debate, said it would not ultimately help the consumers to make the producer bankrupt. It was about time the interests of the producer were definitely considered as a matter of Government policy. No evidence had been brought before the House that the price of dyestuffs would be lower if the British dyestuffs industry had not been developed. Regarding Japan, he was glad to inform the House that the price of dyestuffs sold in Japan was such that they were not likely to compete injuriously with us.

The second reading was carried by 245 votes to 72.

Key Industry Duty

Exemptions for the Coming Year

THE Treasury has made an Order under Section 10 (5) of the Finance Act, 1926, exempting from Key Industry Duty amido guanidine sulphate and fermentographs, being instruments for measuring and recording carbon dioxide evolved during dough fermentation, from December 12, 1933, to December 31, 1934, and continuing the exemption from Key Industry Duty till December 31, 1934, of the articles specified in the following list. The Treasury Order will shortly be published by H.M. Stationery Office.

Scientific instruments: Integrators (planimeter type).

Vacuum tubes: Mercury vapour rectifiers having mercury cathodes, of a capacity of more than 200 amperes, and having more than three main anode terminals.

Compounds of rare earth metals: Celtium oxide; dysprosium oxide; erbium oxide; europium oxide; gadolinium oxide; holmium oxide; lutecium oxide; neodymium oxide; praseodymium oxide; samarium oxide; scandium compounds; terbium oxide; thulium oxide, ytterbium oxide, yttrium oxide.

Synthetic organic chemicals, analytical reagents, other fine chemicals and chemicals manufactured by fermentation processes:—Acid adipinic; acid isobutyl allyl barbituric; acid oxalic; acid propionic; amidopyrin (pyramidon; dimethylamidoantipyrine); ammonium perchlorate; barbitone (veronal; malonal; malourea; acid diethyl barbituric; diethylmalonylurea; hypnogen; deba); bromural (dormigene); butyl methyl adipate; calcium gluconate (calcium glyconate); chinolene (quinoline); chinosol; cocaine, crude; dial (acid diallyl barbituric); dicyandiamide; didial (ethyl morphine diallyl barbiturate); dimethyl sulphate; diphenyl; diphenyl oxide; elbon (cinnamoyl para oxyphenyl urea); ethyl abietate; ethyl cellulose; ethylene bromide; eukodal; furfurol; germanium oxide; glycol ethers, guaiacol carbonate (duotal); lead tetraethyl; lipoiodin; metaldehyde; methyl cellulose; *methyl cyclohexanol methyl adipate; methyl sulphonal (di*ethylsulphonemethylethylmethane; trional); methylene chloride; nickel hydroxide; oxymethyl paraoxyphenyl benzylamine methyl sulphate; papaverine; phenazone (antipyrine; phenyl dimethylpyrazolone; analgesin; anodynine; dimethyl oxychinizin); phenetidine, para-; phloroglucine; phytin; piperazine (diethylene-diamine; dispermin); R. potassium chlorate; potassium ethylzanthogenate (potassium xanthogenate); potassium guaiacol sulphonate (thiocol); R. potassium hydroxide (R. potassium caustic; R. potassium hydrate); R. potassium permanganate; pyramidon-veronal; quinine ethyl-carbonate; radium compounds; salol (phenyl salicylate); sodium ethyl methyl butyl bartiturate; strontium carbonate; strontium nitrate; styracol (guaiacol cinnamate); sulphonal; synthalin; urea (carbamide).

Amorphous carbon electrodes over 3 ft. long, the cross section of which exceeds 12 in. in both length and breadth with longitudinal slots exceeding 2 in. in width and 4 in. in depth.

Vanadium compounds: Vanadium-silica compounds specially prepared for use as catalysts for sulphuric acid manufacture.

A New Plant Construction Material

Good Resistance to Acids, Alkalies, Salts and Solvents

CHEMICAL manufacturers are continuously on the look out for a material to replace earthenware and ebonite in the manufacture of pipes and fittings to resist the action of hydrochloric acid, because earthenware and ebonite are both fragile and may sometimes be unreliable products for use in chemical works. The use of earthenware pipes presents many difficulties in addition to that of fragility. For instance, the joints must be made with metal flanges and bolts and these are liable to rust, while both earthenware and ebonite piping must be carefully supported, otherwise it is liable to fracture under stress due to its own weight.

If one asks "What is the ideal material for the manufacture of piping for hydrochloric acid?" the reply is that it must be a material which is robust and easily handled, one which can be used with screwed or flanged joints (just the same as metal piping) and one which should not require very special methods of support. The Kestner Evaporator and Engineering Co., Ltd., claims that the material which is being sold under the trade name "Keebush" answers all the conditions of this ideal. Just as nickel chrome steels have solved the problem of pipes and fittings for nitric acid, so "Keebush" is claimed to solve the problem of pipes and fittings for hydrochloric acid. "Keebush" is a non-metallic product consisting of certain acid resisting materials, combined with an acid resisting resin, which are wrapped or wound together by a special process, whereby a completely homogeneous product is formed. This operation is carried out in specially designed machines in such a way that a pipe, or tube, is formed that is extremely robust, or a plate or slab of the material is made of the required thickness. The resultant finished material is usually completed to the standard thicknesses and dimensions of normal mild steel piping and sheets.

Pipes and Pipe Fittings

"Keebush" piping can be supplied with either screwed ends and screwed sockets, or with flanged ends; bends, tees and other fittings are also supplied just in the same way as with mild steel steam or water pipes, the flanges for the pipes and fittings being either screwed to the pipe, or finished solid with the pipe during the process of manufacture. Pipes are available in sizes from $\frac{3}{8}$ in. up to 4 in. diameter; larger sizes up to 36 in. can be made to order. While this piping can be made for high pressures, standard pipes and fittings, as usually supplied, are tested to 100 lb. per sq. in., and are used normally for working pressures up to 50 lb. per sq. in.

A piece of 2 in. standard "Keebush" A grade piping 40 in. long and fitted with 6 flanges was submitted to test with the following results: At a load of 225 lb. per sq. in. there was slight seepage through the flange threads at both ends; at a load of 1,300 lb. per sq. in., a number of pin holes opened along the whole length of the pipe; at a load of 1,700 lb. per sq. in. the pipe broke down into a mass of pin holes, and leakage was too great to increase the pressure further.

For bolting up flanges, holding down covers to vessels manufactured in "Keebush," and for similar purposes, metal bolts and nuts can be used, if desired. It is, however, important to notice that bolts, studs and nuts made of the same material, can be supplied. The smallest size manufactured as standard is the $\frac{3}{8}$ in. bolt or stud, and this is supplied in intermediate sizes up to 3 in. The nuts can be made to any standard required, but are generally constructed in accordance with British standards.

Chemical Resistance

"Keebush" A was originally manufactured for use in connection with hydrochloric acid, but repeated tests have shown that it can be successfully applied for other acids, alakalis and certain solvents and spirits, and tests carried out over long periods have shown that the material is unaffected by hydrochloric acid, phosphoric acid, acetic acid, sulphuric acid (up to 50 per cent.), sulphurous acid, aqua regia, boric acid, tartaric acid or citric acid; ammonia, caustic lime, sodium carbonate, potassium carbonate, phosphates, sodium silicate, borax or neutral soap solution; ferric chloride, stannous chloride, zinc chloride, aluminium chloride, ammonium chloride, cuprous chloride, copper sulphate, aluminium sulphate, sodium hyposulphite, or ammonium sulphate; aromatic hydrocarbons (benzol, etc.), alcohols, ethylene chlorhydrin, trichlorethylene, or carbon tetrachloride; chlorine, chlorine water (saturated), chloride of lime solution, hydrogen sulphide, sulphur dioxide, hydrogen peroxide, or sea water. Most of these materials can be used up to a temperature of 100° C. "Keebush" A is *not* resistant to nitric acid, chromic acid (in higher concentrations), concentrated sulphuric acid, caustic soda, hydrofluoric acid, caustic potash, or sodium hypochlorite.

"Keebush" B is resistant to feebly acidic liquors only, ammonia, neutral soap solution, etc.

"Keebush" has been found to be a completely satisfactory material for use with brine, not only because it resists the brine that passes through the pipes, but it is impervious to the damp briny atmosphere which causes attack externally on fittings and pipes. In salt works, in cases where brine is used in connection with electrolytic cells, and all similar work of this kind, "Keebush" can be applied with complete satisfaction. In addition to pipes and fittings, chemical plant and apparatus are being constructed in this material. Rollers, whether steam heated or used cold, can be covered with "Keebush," and so made resistant to certain acids and alkalies.

Notes from India

Extension of Sugar Industry

FROM the report of the Indian Sugar Industry Bureau for the year 1932-33 it is learnt that no less than 57 factories are making sugar direct from cane. Most of these factories are in the United Provinces and in Bihar. The production of sugar totalled 290,000 tons, as against 158,000 tons in the previous year. The increase was due to the larger production of old factories as well as the production of new factories. In connection with the new factories it is interesting to note that large orders for machinery are being placed with British manufacturers, including Mirrlees, Watson and Co., Ltd., of Glasgow.

Sugar Research Institute

THE Sugar Committee of the Imperial Agricultural Research has decided that the Harcourt Butler Technological Institute at Cawnpore should be taken over by the Imperial Research Council and developed and worked as a new sugar industry research institute. The work of the Institute will include research upon Indian sugar factory problems, research in the utilisation of the by-products of the sugar industry, the carrying out of extended tests on new varieties of cane under factory conditions, and the training of students. The institute will have an agricultural section for testing the milling qualities of cane varieties.

New College of Technology

Sir FREDERIC SYKES, the Governor of Bombay, recently inaugurated the New College of Technology, started by the Bombay University under the directorship of Dr. R. B. Foster. This college will provide an opportunity to Indian students to get technological training in India only, instead of in a foreign country. The course will be a post-graduate one and only those students who are of proved ability will be admitted. In his speech, Sir Frederic Sykes advised the university to work in close touch with local industries, and he also advised industrialists to co-operate with the university by allowing the students facilities to obtain industrial experience in the mills towards the end of their course of studies and to employ the graduates when they are qualified.

Notes and Reports from the Societies

The Institute of Metals

North East Coast Section

MR. J. E. HURST presented a paper on "The Addition of Non-Ferrous Metals to Cast Iron" at a joint meeting of the North East Coast Section of the Institute of Metals and the Newcastle Branch of the Institute of British Foundrymen at Armstrong College, Newcastle-on-Tyne, on December 12.

Mr. Hurst spoke of the great development which has taken place since 1926 in the application of those materials known as alloy cast irons to industry, where they are now firmly established. The most important added element in the high duty iron class is nickel, the specific effect of which is the elimination of chill, grain-refinement, and the production of uniform machining properties. When present to the extent of 1.5 per cent., with 0.5 per cent. chromium, it gives good strength and heat resistance. A recent development is the production of irons with tensile strength in the cast condition of 30 tons per sq. in., by the suitable addition of nickel and silicon to a base iron which itself normally casts white. Chromium alone is of service in stabilising carbides and iron containing 0.25 to 0.75 per cent. have found application in motor cylinder work. In greater amounts chromium confers important heat-resisting qualities, for which purpose molybdenum, titanium and vanadium are often added also.

Irons capable of undergoing hardening and tempering may be machined in the soft condition and hardened subsequently for service. They are frequently air-hardening, and contain from 3 to 6 per cent. nickel and 1.5 to 2 per cent. chromium. Irons which have a martensitic structure in the cast condition for use where hard-wearing surfaces are required usually contain 5 to 6 per cent. nickel. In the case of irons suitable for nitriding, in the presence of small amounts of aluminium and chromium, very satisfactory surface hardening can be obtained by treatment in ammonia gas at 500° C. In austenitic irons, a number of combinations serve to preserve the austenitic structure. Typical examples of which are found in Niresist (Ni, 13; Cu, 6; Cr, 2.5 −5); Nomag (Ni, 10; Mn, 5) and Nicrosilal (N, 18, Si, 5 6; Cr. 1.5 −5). In the production of austenitic alloys, copper is now frequently used to replace part of the more expensive nickel, the effect of which it resembles to some extent.

Society of Chemical Industry

Birmingham and Midland Section

THE Birmingham and Midland Section of the Society of Chemical Industry held its first joint meeting with the Food Group on December 14. By courtesy of the directors of the Midland Counties Dairy a visit of inspection was paid to the dairy in the afternoon. Members were impressed by the efficiency of the undertaking and the extent to which use is made of mechanical equipment. The directors entertained the members to tea.

In the evening, Mr. H. W. Rowell presided at a joint meeting at Birmingham University, when Mr. A. W. Knapp (Bournville) read a paper on "Cocoa Fermentation in West Africa." The author pointed out that the cocoa beans as they come from the pod are covered with a fruity pulp, and in this condition would be unsuitable for sending to market. Up to 1900 the great bulk of the cocoa exported from the Gold Coast was simply dried in the sun. Now the great bulk was fermented. Although the word "fermentation" is correctly used in connection with cocoa to indicate a kind of spontaneous decomposition which produces alcohol, it may easily convey a wrong impression, for the small amount of alcohol produced is not the object or the end of the process, the alcoholic liquid being a by-product which is thrown away. The object of the fermentation is to produce a cocoa bean which gives a finer flavoured cocoa or chocolate, and the native farmers ferment their cocoa because it then fetches a higher price. Mr. Knapp described in detail the various methods used by the farmers, and discussed the yeasts and other organisms responsible for the changes which occur during fermentation.

The paper dealt mainly with the author's experiments and observations made on the Gold Coast and in Nigeria. He stated that the temperatures obtained in fermentation in the heap were remarkably high—on the second day 43° C., and on the third 50° C. or over. Three of the yeasts responsible which have been isolated have been found to have an optimum temperature of 40° C. Whether any of the acetic and lactic bacteria which occur on the later stages are impaired by a temperature above 45° C. is not known. When the heap is left unmixed it it liable on the fifth day to become mouldy for some depth from the surface. This growth has been shown by Bunting to be a mixture of a thermogenetic aspergillus and a thermophyllic mucor. This mould development is objectionable, particularly as Dade has shown that the mould penetrates the kesta in front of the germ, and thus makes possible the moulding of the cocoa by ordinary moulds which thrive under less humid conditions. By simply mixing once every two days one avoided not only the risk of mould but also the production of a percentage of unfermented and germinated beans.

A hearty welcome was accorded to the president of the Society (Dr. J. T. Dunn) by the chairman; and the president, in reply, stated that he was trying to visit every section of the Society in the country during his term of office. He recalled that his last visit to the University was when it was the Mason College, and his old friend, Dr. Tilden, was teaching chemistry.

Society of Dyers and Colourists

Manchester : Acetylation of Cotton

A JOINT meeting of the Manchester Section of the Society of Dyers and Colourists and of the Chemical Section of the Manchester Literary and Philosophical Society was held at the rooms of the Literary and Philosophical Society, on December 15, when Mr. W. F. A. Ermen, chairman of the Manchester Section of the Society of Dyers and Colourists, presided.

A paper on "The Acetylation of Cotton and its Application in the Textile Industry" was read by Mr. E. Chippindale. Dealing with the application of acetylated cotton in textiles, Mr. Chippindale stated that as a result of acetylation swelling of the fibre took place together with an increase in weight of not less than 22 per cent. without shrinkage in length. This increase in weight and volume had an important bearing on the final count. It followed, therefore, that the cotton count must be predetermined before submitting it to the acetylation process, depending entirely on the ultimate count required. Low acetylated cotton yarns prepared in the manner governed by Brit. Pat. 280,493, had been registered as "Cotopa" (non-lustrous) and "Crestol" (lustrous). They possessed the structure and strength of the original cotton yarn from which they were made. In common with acetate silks they should not be subjected to any warm alkaline treatments, but could, however, be scoured satisfactorily in a solution of neutral soap, and could also be subjected to high temperatures, *e.g.*, ironing and calendering without risk of injuring the fibre. No deterioration on storage occurred under normal conditions. Even storage at high temperatures did not appear to damage the fibre, which was an important property when yarns were stored in tropical climates. Crestol yarn might be boiled in neutral solutions without losing its lustre, strength, or resist properties, while for desizing the usual malt or diastatic desizing agents could be used with safety. In regard to scouring, a good quality of soap must be used guaranteed free from excess alkali. Chemicals, such as soda or ammonia, should not be used to assist the scouring operations; but if they were they should be under definite control, *viz.*, 5 per cent. Sol. Soda carbonate at 80° C. would hydrolyse in 30 minutes.

White Crestol or Cotopa yarns were not adversely effected by the ordinary strength of bleaching liquors, provided that care was taken to use neutral or slightly acid solutions. In the case of sodium hypochlorite it was advisable to neutralise

with acetic acid; hydrogen peroxide could also be safely used. These yarns could also be sized under the same conditions as applied for cotton yarns, the only precaution necessary being that the size liquor was free from alkali. They had also similar properties to acetate rayon, and precautions observed in the processing of the latter must also be observed in the processing of the former.

Cotopa and Crestol yarns resist the influence of cold concentrated caustic liquor for a limited time, so that fabrics containing those yarns could be mercerised successfully under certain conditions. Good results depended upon rapid and continuous processing under efficient supervision. The goods should be dried before mercerising, while the temperature of the caustic soda must not exceed 34° F. The period of impregnation with caustic soda should not exceed one minute, and all wash waters must be perfectly cold and an abundance of cold water available. It should also be noted that the period between the caustic nip and entering the sour boxes must not exceed 20 to 30 seconds, and that there should be three sour boxes, each being cold. The strength of the sours should be sufficient to completely neutralise the caustic soda, and there should be thorough washing off.

Huddersfield : Dyeworks Equipment

DYEING machinery and dyeworks equipment were discussed by Mr. Frank C. Crawshaw in a paper, illustrated by lantern slides, which he presented to the Huddersfield Section of the Society of Dyers and Colourists, on December 12. Timber, he said, still formed a large part of dyehouse equipment in the form of vats for steeping and dyeing and various parts of machinery, but only a limited selection of a wide variety of woods had been employed. There were possibilities and advantages to be obtained in the examination of a number of the less common types of timber and their application to a particular purpose.

Of late years, and particularly in the post-war period, the development of stainless steels had made rapid strides and these were now marketed in a number of different forms and brands. Monel metal belonged to a different class entirely from stainless steels as this was an alloy derived from a nickel copper ore mined in Canada and in its commercial form contained approximately 68 per cent nickel, 28 per cent. copper, and 3 per cent. manganese, etc.

He had come across many instances of absolute condemnation of stainless steels in the dyeing trade where the wrong type of steel was employed for the particular job or the material itself had been treated in the wrong way when manufacturing the shape of vessel or utensil required. It was, therefore, important that work of this kind should be placed in the hands of engineers who had had the requisite experience in the treatment of these materials.

With regard to resistance to chemical action, large numbers of tests had been made with solutions at various concentrations and temperatures over different periods of time, and engineers fabricating stainless steels or the steel manufacturers themselves would always be pleased to supply data to cover most conditions existing in the average dyeworks. He was of the firm belief that porcelain or earthenware could be more widely used in the dyeing trade. These had the advantage of being smooth, they did not absorb moisture or colour and might be made, in certain instances, to withstand comparatively high temperatures. Their chief disadvantage was brittleness, but as a rule they were easily replaced and not unduly expensive. There were other means of combating the effects of corrosion and one in particular was the method of spraying metals of rust resisting properties, and in some instances chemical resisting, to an iron base.

Dyehouse machinery from the very nature of the processes involved seemed inevitably to be of somewhat crude design. It was scarcely practicable to introduce into a dyehouse amongst water and a steamy atmosphere complicated and delicate machinery nor did the process demand it, but if the machine makers were given a little more encouragement, better and more efficient materials would be used in the construction of these machines which would eventually lead to better design.

It had been the custom all the time he had been connected with the trade for the machine maker to turn out the cheapest possible machine he could knock together in the knowledge that on the difference of a few pounds or even in some cases shillings, rested his chance of securing or losing an order, irrespective of the life or workmanship in a machine. Machinery ought not to be purchased under such conditions, but rather from the value point of view embracing three distinct factors, (1) workmanship, (2) durability and (3) production. Machinery, unlike many other commodities used in the dyeing trade, could not be sampled and once an inferior machine had been installed the inconvenience and annoyance remained just so long as the machine laster. He urged them, therefore, to demand better equipment and pay a little more for a better article, and he assured them that the machine makers themselves would respond by maintaining higher standards of equipment.

Institution of Chemical Engineers

Some Legal Pitfalls

THE next meeting of the Institution of Chemical Engineers will be held jointly with the London Section of the Society of Chemical Industry on January 8, in the rooms of the Chemical Society, Burlington House, Piccadilly, when a paper on "Legal Pitfalls for the Chemical Engineer" will be presented by J. Davidson Pratt, and G. S. W. Marlow. The authors have prepared a particularly informative paper dealing with the many legal points which have to be borne in mind in the design, construction and operation of chemical plant. The following headings indicate the wide scope and usefulness of the paper: Common law—trepass, nuisance, negligence; safety, health and welfare of workers; emission of fumes; discharge of effluents; infringement of patents and designs. The chair will be taken by Dr. Herbert Levinstein (vice-president), at 6 p.m.

Sulphate of Ammonia

Japanese Government to Subsidise Foreign Imports

ALTHOUGH the production of sulphate of ammonia within the Japanese Empire has almost trebled during the past four years, the domestic supply cannot meet the demand, and the Government has had to decide on fundamental measures to cope with the constant shortage on account of the falling off of imports, due to the adverse foreign exchange and the controlled marketing policies of domestic producers. Prices have fallen since the Government's suspension of the fertiliser import licence system during December, 1932, but they have not declined in the same proportion as farm prices, and farmers have had to ask the Government for aid. As a temporary measure until the country has reached self-sufficiency in sulphate of ammonia, the Government plans to subsidise foreign imports to the extent of 20 yen per ton. The present market price of Japanese sulphate of ammonia is about 88 yen per metric ton, the imported article being quoted at about 100 yen per ton, whereas the farmers consider that the market quotations should be about 80 yen per ton. The Department of Agriculture and Forestry has requested the Finance Department to increase its budget for the 1934-35 fiscal year by 2,400,000 yen to provide for the subsidy which will be given direct to the farmers importing the foreign product.

It is estimated that production of sulphate of ammonia during 1934 will fall about 100,000 metric tons short of the estimated consumption in Japan proper, Taiwan, and Chosen, which is placed by the Japanese Fertiliser Association at 650,000 tons, 85,000 tons, and 175,000 tons respectively. Production during 1932 amounted to 684,114 tons, compared with 509,098 tons in 1931, 395,200 tons in 1930, and 243,400 tons in 1920. During the early part of 1931, the Japanese Fertiliser Association estimated that production during 1932 would amount to 666,000 tons, while other estimates placed the figure as high as 750,000 tons. Estimates of potential production for the present year were originally placed as high as 900,000 tons, but actual production for the first half of 1933 amounted to only 335,607 tons, compared with 347,691 tons during the corresponding period of 1932.

New Technical Books

AN INTRODUCTION TO THERMODYNAMICS FOR CHEMISTS. By D. Johnstone Martin. pp. 343. Edward Arnold and Co. 16s.

Whilst there are several books on the subject of chemical thermodynamics, written in the English language, it is felt that their treatment of the concepts of free energy and entropy is hardly adequate to their importance. The only book which differentiates clearly between free energy and maximum work is that of G. N. Lewis and M. Randal, but the author of the volume under review points out that it is too advanced for the beginner. He had therefore attempted to satisfy the need for an introductory text-book which does treat of this fundamental question, and which, at the same time, considers the more recent applications of thermodynamics such as the theory of Debye and Hückel on the treatment of concentrated solutions. The subject of entropy, moreover, is approached in a manner quite different from that usually adopted.

* * *

THE LABORATORY WORKSHOP. By E. H. Duckworth and R. Harries. pp. 264. G. Bell and Sons, Ltd. 10s.

The subject matter of this book provides a simple course in the making of apparatus and the use of tools. The aim of the authors is to encourage the design and construction of home-made apparatus, not only because of the pleasures and advantages which the use of a laboratory workshop brings, but also because—in these times when economy is urged—the allocation of money for scientific apparatus is all too small, and self-help seems to be the only way in which efficient teaching is to be secured. The opening chapters concern the general equipment of the workshop, tools and materials. These are followed by others on how to mark out, cut and bend metal, screw cutting, soldering, woodworking, electric wiring and the cutting, drilling and grinding of glass. There is also a chapter on drawings and designs. A small workshop enables repairs to be done at negligible expense without delay; this book will be found very useful with that particular object in view.

* * *

SOLVENTS. By Thos. H. Durrans. Third and revised edition. pp. 205. Chapman and Hall, Ltd. 10s. 6d.

The great activity and constant advance shown by the lacquer and similar industries necessitates the continual revision and amplification of any collection of information regarding solvents. This book was first published in 1930, and while no deep-seated advance has been made in the science of the subject since the second edition appeared (1931), technically there is much which is new and cannot be ignored. For instance, a number of new solvents and plasticisers are now available industrially and these have considerably widened the field of possible technical applications. Every possible effort has been made to make the third edition comprehensive, and with this in view information has been included regarding certain new solvents which are potentially of great interest although not yet available on a commercial scale. A plasticiser-dosage table, which may be of some practical value, has been added as a new feature.

* * *

THE INSTITUTION OF GAS ENGINEERS TRANSACTIONS. 1928-1929 (Vol. 78) and 1929-1930 (Vol. 79). pp. 490 and 914. The Institution of Gas Engineers. 25s. per volume.

These two volumes place on record the proceedings in two of the most eventful years in the long history of the Institution of Gas Engineers, the former being the year in which the Institution received its Royal Charter and the latter the year in which it inaugurated its autumn research meeting in addition to its annual meeting in June. The Charter was granted in May, 1929, during the presidency of Mr. John Terrace, and from that time the members of the Institution became qualified to designate themselves as "chartered gas engineers." Up till that time the Institution had held only one meeting each year, but the research activities both of the Institution itself and of the other organisations with which it was closely allied, were becoming so extensive that there was not adequate time for the proper discussion of the reports as well as the papers which eminent gas engineers presented, and the autumn research meeting was therefore instituted in November, 1929, the first of these meetings being presided over by Mr. C. S. Shapley. The June meeting is now confined to papers, and the research meeting has continued to grow in importance and usefulness in each succeeding year. Many papers of outstanding merit were presented during the two years covered by the volumes now issued, and the valuable points brought out in the discussions on both papers and research reports are faithfully reported. Mr. J. R. W. Alexander, the secretary of the Institution, is to be complimented upon the thoroughness with which he has carried out the compilation of the Transactions.

* * *

CELLULOSE ACETATE; ITS MANUFACTURE AND APPLICATIONS. By Alfred George Lipscomb. pp. 304. Ernest Benn, Ltd. 21s.

The literature relating to cellulose acetate is very scattered and consists in the main of patent specifications, isolated papers, and brief descriptions of manufacturing processes in books dealing with rayon in general. This new book is therefore especially welcome. Even though it does not claim to be exhaustive, it is, nevertheless, a clear exposition of manufacturing processes, such adequate description of the lay-out of plant for the manufacture of cellulose acetate and of acetate rayon. In addition, there are chapters dealing with the chemistry and physics of cellulose and cellulose acetate in the light of recent researches. The work of the chemist in the acetate industry is described in connection with the testing of raw materials, process control and research; its relationship to the other departments of the factory is also discussed. In other directions the manufacture of fabrics including dyeing, printing and finishing, and the manufacture of films and plastics, is dealt with. There are very full indexes and a bibliography.

Import Duties Orders

Synthetic Dyestuffs added to Free List

IN accordance with recommendations of the Import Duties Advisory Committee, the Board of Trade is issuing an open general licence under the Dyestuffs (Import Regulation) Act, 1920, with effect from December 27, to permit the importation of compounds, preparations and articles not suitable for use in dyeing, manufactured from synthetic organic dyestuffs—including pigment dyestuffs—whether soluble or insoluble. The Treasury has also issued Orders under the Import Duties Act with effect from the same date carrying out other recommendations of the Committee. The first Order provides for the addition to the free list of synthetic organic dyestuffs, and the second imposes an additional duty of 10 per cent. on pigments that are synthetic organic colours and colouring matters.

Italian Raw Materials

A National Type Collection

A COMPLETE COLLECTION of samples of all raw materials used by Italian industry, both imported and of native origin, to be known as the National Raw Material Archive, is to be prepared under the auspices of the National Research Council. The archive will also contain complete and up-to-date statistical, geological, geographical, and technical data on each product. The following bodies are called upon to co-operate in forming and maintaining the Raw Materials Archive: The Central Statistic Institute, the Central Customs Bureau, the National Export Institute, the General Confederations of Industry and of Agriculture. The primary object of the archive will be a complete survey of Italy's raw material situation and its permanent use to provide material and incentive for research and experimental work aiming to make the country self-supporting in as many raw materials as possible.

Discoveries from Heavy Hydrogen

Suggested New Name

A DISCUSSION on heavy hydrogen was opened by Lord Rutherford at the rooms of the Royal Society on December 14. After relating the circumstances of the discovery of heavy hydrogen by the American chemists Urey, Birckwedde and Murphy, he suggested the name diplogen for heavy hydrogen and the name diplon for the nucleus of the atom of heavy hydrogen. Hitherto, the name deuterium has been used for the former, and deuton, or deuteron, for the latter. Lord Rutherford acknowledged that the name given by a discoverer was generally adopted by the scientific world, but he regarded the question as of great scientific importance in the case of heavy hydrogen, and thought that deutons were liable to be confused with neutrons—especially if one had a cold. As neutrons were involved in any discussion of heavy hydrogen, the question of confusion was very pertinent.

Dr. N. V. SIDGWICK gave strong support to Lord Rutherford's terminology. He said he was present at the Chicago meeting when the discovery was announced, and terminology caused great difficulty. When a missing element was recently discovered, it did not matter much how it was called—"Florentinium" or "Mussolinium"—because they would come across it so seldom, but heavy hydrogen was another matter.

Dr. F. W. ASTON also supported Lord Rutherford's terminology. He thought, from his remembrance of the Chicago meeting, when the discussion tended to become acrimonious, that the Americans would not take kindly to it. While there he spoke to Professor Bohr, who thought that as the substance was hydrogen it ought to be called hydrogen. Dr. Aston admitted that a discoverer was allowed to give a name to what he had discovered, but denied that the scientific public were under any obligation to use it. He instanced Uranus, which was originally called Georgium Sidus by William Herschel, and said that the word isotope and his own mass-spectrograph had changed in meaning since they were first put forward.

In the discussion on the properties of heavy hydrogen, Lord Rutherford gave details of a new diffusion process by which it has been obtained in small quantities without any trace of ordinary hydrogen. He also referred to the structure of the diplon, and said the most obvious suggestion was that it consisted of two protons and an electron, but it might consist of a proton and a neutron. He had bomdarded heavy hydrogen with alpha particles from polonium, and the neutrons obtained were only 1 per cent. of those obtained when beryllium was similarly bombarded.

Professor POLANYI described his experiments with heavy water, and gave reasons for believing that in some circumstances heavy hydrogen will react with other substances more quickly than ordinary hydrogen.

Dr. HARTECK made a number of experiments with heavy water which contained heavy hydrogen instead of ordinary hydrogen.

Yellow Sodium Light

A New Lamp for Detecting Colourless Details

DR. M. LUCKIESH and Dr. F. K. Moss, of the Lighting Research Laboratory of the General Electric Company of America, reported at a meeting of the Optical Society of America, on October 17, an interesting property of the new sodium vapour lamp which will shortly be upon the market. They stated that for revealing the details of small colourless objects the yellow single solour light from sodium vapour is definitely and markedly better than the light emitted by ordinary incandescent tungsten filament lamps. In addition to revealing the details of small objects better, the speed of retinal impression is also higher. On the average, the proportion of the light reflected by a large number of coloured specimens is much the same for both illuminants, although there is a wide variation for individual colours. Sodium light enhances brightness contrast between various pairs of colours in more cases than tungsten light does, but some of the exceptions are important.

Catalysts for Hydrogenation

Research at the Canadian Department of Mines

FOR several years the Canadian Department of Mines has been carrying out small-scale tests on the hydrogenation of bitumen and the report, published recently, includes some notes on the use and effect of different catalysts. The reaction bomb, into which the hydrogen was forced, was made of chrome-nickel steel with ⅛ in. walls, the capacity being 920 cc. The bomb was fitted with a paddle rotating at 24 r.p.m., and was electrically-heated externally to 410° C. The charge of bitumen was 200 grams, the initial pressure 1,470 lb. per sq. in. and the reaction duration 30 min. The type and amount of catalyst, the yield of gasoline obtained by distillation at 410° F. of the liquid product from the bomb, and the yield of coke or solid residue, are given below:—

	Catalyst (per cent. of charge).	Gasoline (per cent. of charge).	Coke (per cent. of charge).
Nickel carbonate	3.6	17.3	12.7
Copper oxide	2.9	15.7	15.4
Ammonium molybdate ...	3.3	17.2	15.6
Tin	3.4	15.1	16.2
Zinc oxide	3.0	22.3	26.4
Chromic oxide	5.0	23.5	28.4
Iron oxide	5.0	14.1	37.7
No catalyst	—	14.5	13.9

The catalysts studied did not cause the removal of sulphur as hydrogen sulphide. Carbon formation was greatest in the case of iron oxide and least in the case of nickel carbonate.

The Sulphide Corporation Ltd.

A Welcome Improvement

THE thirty-seventh annual general meeting of the Sulphide Corporation, Ltd., was held in London on December 15.

The Hon. Geoffrey C. Gibbs (chairman) said that while the position was not by any means as good as they would have liked, as the directors had not felt justified in recommending a dividend, a profit of £37,000 compared with the heavy losses of the previous two years, was a welcome improvement.

The Central Mine worked continuously throughout the year, and 123,000 tons of ore were raised, but metal prices remained at low levels, and a slight improvement in the price of silver and spelter was offset by lead failing to maintain the improvement of the previous year. A comparison with pre-war prices showed that if only metals would fetch the prices of 1913 their results would be very satisfactory. It was a remarkable achievement on the part of Mr. Gardner and the staff at Central Mine to have so improved the recoveries and reduced the costs that, with the help of the exchange premium, the heavy loss incurred in keeping the mine closed had been eliminated. The cost of keeping the mine closed had been approximately £50,000 a year, and without the premium on exchange, the loss in working would also have been very heavy. While the saving of £50,000 had been satisfactory, it had only been achieved by the consumption of a large quantity of ore. There was justification for the hope of an improvement in metal prices, at least as far as zinc was concerned.

The works at Cockle Creek, where they manufactured superphosphates, cement, and sulphuric acid, had enabled them to show a profit in working account for the first time for three years. The sales of superphosphates amounted to 30,062 tons, an increase of 3,658 tons, and the sulphuric acid plants, which had also worked continuously throughout the year, produced nearly 20,000 tons Mono, an increase of 11,622 tons over the previous year. Since the close of the year the Seaton Carew works had been sold for cash to a subsidiary of the Imperial Smelting Corporation. These works were originally purchased to produce an outlet for the zinc concentrates from the Central Mine, but the life of that mine was now limited, and when production there ceased, Seaton Carew would have no assured supply of concentrates. It was, therefore, felt that the opportunity presented by the offer should not be allowed to go by, especially as it was combined with an offer to purchase their production of zinc concentrates for the remainder of the life of the mine.

News from the Allied Industries

Beet Sugar

THE LINCOLNSHIRE SUGAR BEET CO., which controls large beet sugar factories at Bardney and Brigg, announces that the full requirements of next year's manufacturing campaign have been offered by farmers. Contracts will be made and the full allotment of acreage completed almost immediately.

Paper

W. V. BOWATER AND SONS, the paper business, has changed the date for closing its accounts, and the report just issued covers only nine months to September 30. The profits work out at £42,531, or approximately at the same rate as for the year 1932. The dividend on the ordinary shares is again at the rate of 8 per cent., and £15,000 is added to general reserve, the carry forward being practically unaltered at £26,456. It is stated that the company has disposed of practically the entire output for 1934 of both the associated mill companies, including that from the two new machines at the Mersey Mills, the installation of which has now been completed.

China Clay

THE RENEWED industrial activity is being reflected in the china clay industry as the shipments for November reveal a further improvement of trade to the extent of over 6,000 tons. Throughout the year there has been a gradual advance compared with last year in the volume of shipments made and it is satisfactory to know that there is every likelihood of it being maintained until the end of December. There is no doubt that the removal of the ban on English clays to France has helped to quicken the European market and there are other visible signs that other important markets are returning. This, and a further depletion in the ranks of the unemployed china clay workers, are very encouraging tokens. The year 1933 is sure to reveal a much larger turnover than 1932, amounting to about 100,000 tons, which cannot but be satisfactory to all concerned. The details of shipments in November are as follows:—Fowey—12,858 tons china clay, 2,693 tons china stone, 60 tons ball clay; Par—8,654 tons china clay, 180 tons china stone; Charlestown—7,818 tons china clay, 852 tons china stone; Penzance—642 tons china clay; Newham—136 tons china clay; Plymouth—135 tons china clay; by rail to inland destinations—5,874 tons china clay; aggregating 69,902 tons against 63,806 in October.

Low Temperature Carbonisation

IN A CIRCULAR offering to ordinary shareholders 3,000,000 new 2s. ordinary shares at par the directors of the Low Temperature Carbonisation Co. point out that the demand for "Coalite" smokeless fuel is continuing to increase with great rapidity, and the company is being urged to increase materially its output of petrol and oils. In order to reap the full benefit of the successful pioneer work already carried out by the company, it is considered essential for further plants to be erected. The board has, therefore, decided to offer to the existing shareholders the right to subscribe at par for the capital required for the construction of such plants. In the opinion of the directors the erection of such plants should enable the company to increase its profits by an amount equivalent to 30 per cent. of the new capital employed. As the company has ample cash resources for the conduct of its present business, the whole of the new capital will be utilised in the construction of further plants. In his speech at the annual meeting of the company on December 14, the chairman stated that it would be easy to grant licences to work the "Coalite" process to subsidiary companies working with new capital provided from outside, but the share of the profits that would accrue to the shareholders of the parent company would be relatively small compared to what it would be if that company owned the plants. He saw no reason whatever why the profits of the company should not be increased to £250,000 per annum, and within a very short time, providing capital for additional works was forthcoming.

Iron and Steel

THE MANAGING DIRECTOR of Thos. Firth and John Brown, steelmakers and engineers, Sheffield, says the company has now on the books half a million pounds' worth of more work than at this time last year. He believes the concern is in a more efficient state than either of the two companies individually ever were in their history.

AN OFFER of Richard Thomas and Co., Ltd., to purchase the ordinary shares of the Briton Ferry Steel Co., Ltd., at 30s. each was rejected at the meeting of Briton Ferry shareholders held at Swansea on December 14. Major J. M. Bevans presided and the proceedings were private, but it is stated that the offer was rejected by an overwhelming majority. The meeting was largely attended, and during the proceedings it was estimated that the present value of Briton Ferry Ordinary shares is at least 52s.

Non-Ferrous Metals

THE INTERNATIONAL ZINC CARTEL, which came into being in April, 1931, has been meeting in Brussels. It was stated that present zinc statistics were satisfactory, stocks on hand, which had increased in September and October, having now decreased. In view of the favourable conditions, enabling a balance to be struck between production and consumption, the meeting decided to adjourn without modifying the present arrangements until the end of July, 1934. It was decided that production should be maintained at a maximum of half the total capacity of the works.

MR. T. R. A. WINDEATT, the head of Osborne and Chappell, Ltd., addressing the Federal Council at Kuala Lumpur on December 19, contended that Malaya could have entered the new tin restriction scheme under more satisfactory conditions, if the Federated Malay States Government had made a firmer stand. Mr. Windeatt said that Siam was "merely flirting" with restriction, while Burma, the Belgian Congo and Australia had been invited to participate on practically their own terms. He expressed the opinion that a great opportunity of placing the scheme of control on a sound basis had been missed owing to over-anxiety to grasp at immediate ease and comfort. Restriction on the present basis, Mr. Windeatt concluded, must not be perpetuated.

Paint and Varnish

LORD GREENWOOD (chairman), presiding at the fifty-fourth annual general meeting of Lewis Berger and Sons, Limited, held on December 14., said that despite the past year's difficulties results were satisfactory. Home trade had increased in volume with expansion in every section—paint, dry colour, varnish, and cellulose. Pompeian enamel-paint and Lifeguard car polish sales showed further advance through continued national newspaper advertising, and 1934 plans should result in still greater progress. Sales of Proxcelin cellulose enamel, in growing demand in many different industries, had been progressive since its introduction eight years ago and showed further encouraging increase. Highest grade dry colours, for which Berger was noted since 1760, showed marked improvement. Export business had increased, but efforts were still hampered by unsettled exchanges, higher tariffs, etc. He believed we were recovering economically and industrially more rapidly than any other nation. Berger was ready to seize every opportunity and with returning confidence would secure increased export business. They were proceeding with an expansion programme in both home and export and had spent considerable sums which should be productive in the future. They had under construction at Homerton a great five-storey building of 50,000 sq. ft floor space to give better service in handling their growing volume of business. The Australian factory's great improvement reflected first results of better business conditions there. The New Zealand factory returned a satisfactory dividend on their investment, as did the factory in South Africa, where business had improved so much that their subsidiary had finished with a fair increase. The French factory had done much better than last year, and all other subsidiaries had operated at a profit.

Inventions in the Chemical Industry

Specifications Accepted and Applications for Patents

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Emulsifying Agents

EMULSIFYING agents are obtained by sulphonating hydroxy fatty acid containing at least sixteen carbon atoms in the molecule and derivatives thereof with at least an equal weight of sulphuric acid containing at least 10 per cent. of water, at a temperature which is not sufficiently high to remove the sulpho group from the products. Fat solvents, such as hydrogenated phenols or naphthols, hydrocarbons and high molecular alcohols may, for example, be emulsified therewith. In examples castor oil is sulphonated with solutions of sulphuric acid of 85 and 90 per cent. strength at temperatures of 10-20° and 25-30° C.; after sulphonation, the products are washed with solutions of salt or sodium sulphate, and neutralised. Sodium acetate may be mixed with the products to act as a buffer salt. (See Specification No. 392,568, of A. G. Bloxam)

Manufacture of Berylium Fluoride

BERYLLIUM fluoride is obtained by treating the double fluoride of beryllium and an alkali metal in solution or aqueous suspension with hydrofluosilicic acid and separating alkali fluosilicate formed from the solution of beryllium fluoride by filtration. By concentrating the filtrate to a density of 1.58 residual fluosilicate is precipitated. The acid used may be replaced wholly or partly by a mixture of hydrofluosilicic acid or hydrofluoric acid and silica, or by gaseous silicon tetrafluoride. Alternatively beryllium fluosilicate, or a fluosilicate such as that of calcium or magnesium giving an insoluble fluoride, or aluminium fluosilicate which gives a double fluoride with the alkali fluoride, may be used. The alkali fluosilicate recovered may be used in known manner to obtain from beryl the double fluoride to be treated by the process of the invention. (See Specification No. 389,053 of Compagnie de Produits Chimiques et Electrometallurgiques Alais, Froges, et Camargue).

Purifying Heavy Fuel Oil

HEAVY fuel oils, *e.g.*, residual tar oils and gas oils, are purified and rendered fit for use in burners and with Diesel or semi-Diesel engines by heating slowly to and maintaining a temperature of 50-100° C. whereby impurities rise to the surface, abruptly cooling the surface so as to form a film which sinks through the oil, and separating the oil and deposit. Preferably 5-20 per cent. of an oil complemental to that treated is added, *e.g.*, an oil rich in volatile hydrocarbons to one void of such. In an example, 85 kg. of residual tar oil from coke ovens is slowly warmed to 30° C. by a closed steam coil, 15 kg. of gas oil is added, and the temperature raised to 80° C. in 4 hours and maintained for 4 hours; the upper layer is coiled by a cold water coil, the mass allowed to settle for 40 hours, and the oil is decanted; the residual 10 kg. may be settled longer, and a further 5 kg. of oil decanted. (See Specification No. 389,925, of A. Haeck and J. Spiltoir.)

Non-Corrosive Detergents

CLEANSING agents without action on aluminium, tin, or their alloys consist of preponderating quantities of alkaline alkali phosphates mixed with compounds of aluminium or tin capable of reacting in aqueous solutions with the phosphates in such proportions that 1 per cent. or stronger aqueous solutions do not attack aluminium or tin or their alloys at temperatures up to 90° C. Specified compounds are aluminium hydroxide, sulphate, and chloride, and stannous chloride; when aluminium sulphate is the compound more than 20 per cent., preferably 25 per cent. or more, is used. For example, 250 gm. of crystalline aluminium sulphate is mixed with 750 gm. of crystalline trisodium phosphate, or 250 gm. of stannous chloride with 750 gm. of calcined trisodium phosphate, and made up as a 5 per cent. solution. (See Specification No. 390,249, of Chemische Fabrik Budenheim A.G.)

Transparent Soap

TRANSPARENT soaps of high fatty acid content, *e.g.*, 70-75 per cent., are made by saponifying the usual mixtures of fats of a high degree of purity with resin by means of alkali of a high degree of purity, rapidly cooling the hot fluid soap in a thin layer to atmospheric temperature, drying in air at atmospheric temperature to such an extent as to avoid supersaturation, milling cold, compressing and forming the rope into pieces as desired. Fillers, *e.g.*, glycerine, alcohol, sugar, soda, are preferably omitted; and the use of palm nut oil, or castor oil is not essential. In an example, 61 kg. of tallow, 18 kg. of coco nut oil, 11 kg. of castor oil, and 10 kg. of resin is saponified with 45.8 kg. of 39° Bé soda lye; the transparent soap paste is cooled on rollers in 2-3 seconds from 90-100° C. to about 20° C., the ribbons or plates scented, milled once or twice on cold rollers and passed through a press or plodder. (See Specification No. 392,400, of Henkel et Cie Ges.)

Stabilising Chlorinated Hydrocarbons

CHLORINATED hydrocarbons containing two carbon atoms are stabilised by adding a small proportion of an alkylamine which prevents the liberation of acid in degreasing metals and fabrics. Suitable alklylamines are dibutylamine and mono-, di- and triethylamine. If the boiling point of the amine is near to that of the chlorinated hydrocarbon, the mixture may be distilled with little change; such a mixture is trichlorethylene and triethylamine. A small quantity of an alkaline substance such as lime or hydrated lime may be added which is capable of decomposing the hydrochlorite of the added amine. Apparatus parts in permanent contact with chlorinated hydrocarbons should not be made of copper or its alloys, but the treated solvent may be used for degreasing copper or brass articles, as the contact is of relatively short duration. (See Specification No. 391,156, of P. W. Penny and Imperial Chemical Industries, Ltd.)

Specifications Accepted with Dates of Application

ETHYLENE OXIDE, production, particularly for the preparation of ethylene-glycol and its derivatives.—Soc. Française de Catalyse Generalisee. Dec. 19, 1931. 402,749.

ORGANIC SALTS of bismuth and oleaginous solutions thereof, process for manufacture.—G. B. Ellis (Soc. des Usines Chimiques Rhone-Poulenc). May 2, 1932. 402,762.

METALLIC LEAD-ALKALI, lead-alkaline-earth, and like alloys.—M. Schlötter. June 1, 1931. 402,769.

SALTS, SALT SOLUTIONS, and other solutions, separation or purification.—Dr. G. Austerweil and C. Jeanprost. June 2, 1931. 402,770.

CELLULOSIC FILMS, sheets, and threads, manufacture.—C. W. Bonniksen and Protectoglass, Ltd. June 4, 1932. 402,784.

FILMS AND COATINGS of cellulosic material, production.—C. W. Bonniksen and Protectoglass, Ltd. June 4, 1932. 402,807.

TECHNICALLY-VALUABLE COMPOUNDS from oxidation products of drying oils, process for manufacture.—I. G. Farbenindustrie. June 4, 1931. 402,759.

ARTIFICIAL TEXTILE MATERIALS, manufacture and treatment.—H. Dreyfus. June 7, 1932. 402,776.

ARTIFICIAL MANURES, manufacture.—Sturtevant Engineering Co., Ltd., F. W. R. Williams and A. Ogilvie. June 10, 1932. 402,832.

DIACETONE ALCOHOL.—British Industrial Solvents, Ltd., and E. Connolly. June 8, 1932. 402,788.

MONOAZO DYESTUFFS, process for manufacture.—A. Carpmael (I. G. Farbenindustrie). June 14, 1932. 402,849.

CARBONISATION of solid fuels at low temperatures, process and apparatus.—British Carbonised Fuels, Ltd., and H. P. Hird. June 16, 1932. 402,853.

ADDITION COMPOUNDS of hypochlorous acid or hypobromous acid with unsaturated organic compounds preparation.—Naamlooze Vennooschap de Bataafsche Petroleum Maatschappij. July 25, 1931. 402,880.

BENZOIC ACID and benzoates, production.—Bozel-Maletra Soc. Industrielle de Produits Chimiques. June 23, 1932. 402,882.

COLOURING RUBBER and masses containing rubber.—J. Y. Johnson (I. G. Farbenindustrie). Oct. 12, 1932. 402,920.

HYDRO RUBBER, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). Oct. 22, 1932. 402,925.

HALOGENATION of unsaturated hydrocarbons.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Nov. 11, 1931. 402,928.

MIXED ANHYDRIDES of silicic acid and carboxylic acids, manufacture.—Henkel et Cie. Ges. April 22, 1932. (Samples furnished.) 402,973.

THERMOPLASTIC MATERIALS, manufacture.—Celluloid Corporation. March 12, 1932. 402,974.

TREATMENT of silicates with acids in order to obtain their soluble salts.—F. Jourdan. March 18, 1932. 402,977.

AZO DYESTUFFS of the stilbene series, manufacture.—I. G. Farbenindustrie. May 11, 1932. 403,007.

SOLID DIAZO SALTS, manufacture.—I. G. Farbenindustrie. May 21, 1932. 403,013.

AZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. July

TUNGSTEN, molybdenum, vanadiam, titanium, or uranium, production of water-soluble compounds.—Metalliges, A.G., and M. G. Freise. June 14, 1933. 403,025.

STABILISING PEROXIDE SOLUTIONS and the application thereof to bleaching.—H. T. Böhme A.-G. July 28, 1932. 403,035.

COLOURED CELLULOSE MATERIAL, process for manufacturing.—H. Dosne. Aug. 19, 1932. 403,049.

Applications for Patents

HEAVY METAL COMPLEX COMPOUNDS of mercapto pyrimidines, manufacture.—I. G. Farbenindustrie. Dec. 4. (Germany, Dec. 3, '32.) 34037.

ORTHO-OXYAZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. Dec. 6. (Germany, Dec. 7, '32.) 34300.

FILM-FORMING COMPOSITION.—I. G. Farbenindustrie. Dec. 6. (Germany, Dec. 6, '32.) 34304.

DYEING and printing.—Imperial Chemical Industries, Ltd., F. Lodge and C. H. Lumsden. Dec. 1. 33771.

AZO DYESTUFFS, manufacture and application.—Imperial Chemical Industries, Ltd., and A. H. Knight. Dec. 4. 34014.

ANTHRAQUINONE DYESTUFFS, manufacture, etc.—Imperial Chemical Industries, Ltd., F. Lodge and H. A. Piggott. Dec. 6. 34292.

DYEING and printing.—Imperial Chemical Industries, Ltd., and A. Wormald. Dec. 6. 34293.

HALOGEN DERIVATIVES of rubber, etc., production.—Metallges Akt.-Ges. Nov. 30. (Germany, Dec. 2, '32.) 33683.

CONCENTRATION, distillation, or evaporation of liquid substances. A. Ponzini. Dec. 1. (Italy, Dec. 3, '32.) 33798.

DYEING LEATHER, process.—Soc. of Chemical Industry in Basle. Dec. 5. (Switzerland, Dec. 21, '32.) 34172.

SEPARATION of mixtures of liquids and solids.—Standard Oil Development Co. Nov. 30. (United States, May 3.) 33613.

MOTOR FUELS.—Standard Oil Development Co. Dec. 1. (United States, Feb. 23.) 33750.

PURIFICATION of sugar refinery, etc., juices.—D. Testini. Dec. 5. 34227.

VULCANISING.—B. V. Vertel. Dec. 5. (Hungary, Oct. 14.) 34162.

AZO DYESTUFFS, manufacture.—M. J. G. Bader, Dec. 12. (France, Dec. 13, '32.) 34994.

ASSISTING AGENTS in textile, etc., industries, manufacture.—A. G. Bloxam (Soc. of Chemical Industry in Basle). Dec. 12. (April 27.) 34974.

SAFETY GLASS, manufacture.—C. F. Boehringer and Soehne Ges. Dec. 12. (Germany, Dec. 13, '32.) 34995.

OXIDATION PROCESSES.—H. Dreyfus. Dec. 12. 35011.

ANTHRAQUINONE DYESTUFFS, manufacture.—Chemical Works (formerly Sandoz), and G. H. Ellis. Dec. 8. 34642.

SULPHURIC ACID, manufacture.—A. M. Clark, Imperial Chemical Industries, Ltd., and D. Tyrer. Dec. 13. 35132, 35133, 35134.

HYDRATION OF OLEFINES.—Distillers Co., Ltd., J. B. Dymock and W. P. Joshua. Dec. 13. 35085.

OXYGENATED ORGANIC COMPOUNDS, production.—H. Dreyfus. Dec. 12. 35013.

COLOURING MATERIALS.—E. I. du Pont de Nemours and Co. Dec. 8. (United States, Dec. 9, '32.) 34577.

PRODUCTION OF DYEINGS, ETC.—Durand and Huguenin Akt.-Ges. Dec. 12. (Germany, Dec. 12, '32.) 34975.

PHOSPHATES, method of manufacturing.—J. P. Fraser. Dec. 7. 34491.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

PRICES of chemical products have shown little change during the week, and business in the home market has remained at its recent average. In the industrial chemical section acetic acid, acetone and oxalic acid have been in good demand, and there has been fair inquiry for ammonium chloride, formaldehyde, salt cake, formic acid and hydrochloric acid. The coal tar products market is satisfactory except in the case of pitch, the position of which remains uncertain. There has been a particularly good demand for creosote oil. Several price reductions are announced in the essential oils section. Conditions in the pharmaceutical section remain unchanged. With the exception of the figures quoted below, the prices of chemical products remain as reported in THE CHEMICAL AGE of December 9 (pages 538-539).

LONDON.—Markets continue firm generally with a good steady demand in almost all directions. There is nothing fresh to report in the coal tar products market. Prices are fairly firm, and the majority remain unchanged from last week.

MANCHESTER.—Values on the Manchester chemical market during the past week have been steady almost throughout the range, arsenic being one of the outstanding weak sections. The rising tendency of copper during the past week has had a stiffening influence on the market for sulphate and sellers are inclined to quote at higher prices than have lately been ruling. Further contract bookings over next year have been reported this week, and a good many users in the district are now well covered for the early months. Deliveries into consumption have been maintained at a fairly satisfactory level though next week is expected to show a marked seasonal falling off, more particularly as the cotton mills in Lancashire are closing for the whole of the week. Prospects for business after the holidays, however, are believed to be rasonably bright and the recent improvement is expected to be at least maintained. The light coal-tar products have been a fairly active market, but the export trade in pitch remains disappointing.

SCOTLAND.—The approaching Christmas and new year holidays are having a dulling effect on the Scottish heavy chemical market and this, taken in conjunction with many annual balances and consequent stocktakings, has resulted in busieess being exceptionally quiet.

General Chemicals

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £49 to £52 ex store. MANCHESTER: £48 to £54 ex store.

ARSENIC.—LONDON: £16 10s. c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r. mines. SCOTLAND: White powdered, £23 ex wharf. MANCHESTER: White powdered Cornish, £21 at mines.

FORMALDEHYDE.—LONDON: £27 per ton. SCOTLAND: 40%, £28 ex store.

POTASH, CAUSTIC.—LONDON: £42. MANCHESTER: £40.

SODIUM NITRITE.—LONDON: £17 10s. to £19 10s. per ton d/d station in drums.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 8½d. to 8¾d. per lb.; crude, 60's, 2s. 5d. to 2s. 6d. per gal. MANCHESTER: Crystals, 8¾d. per lb.; crude, 2s. 5d. to 2s. 6d. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.

ACID, CRESYLIC.—99/100%, 1s. 8d. to 2s. 3d. per gal.; pale, 98%, 1s. 6d. to 1s. 7d.; according to specification; refined, 1s. 10d. to 2s. LONDON: 98/100%, 1s. 3d.; dark, 95/97%, 11d. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; 97/99%, 1s. to 1s. 1d.; dark, 97/99%, 11d. to 1s.; high boiling acid, 2s. 6d. to 3s.

BENZOL.—At works, crude, 10d. to 10½d. per gal.; standard motor 1s. 5d. to 1s. 5½d.; 90%, 1s. 6d. to 1s. 7d.; pure, 1s. 8½d. to 1s. 9d. LONDON: Motor, 1s. 6½d. SCOTLAND: Motor, 1s. 6½d. to 1s. 7½d.; 90%, 2s. 0½d. to 2s. 1½d.

PITCH.—Medium soft, £3 10s. to £3 12s. per ton. SCOTLAND: £3 15s. to £4 f.o.b. Glasgow. MANCHESTER: £3 to £3 2s. 6d. f.o.b. LONDON: £3 7s. 6d. to £3 10s. f.o.b. East Coast port for next season's shipment.

PYRIDINE.—90/140, 5s. to 5s. 9d. per gal.; 90/180, 2s. to 2s. 6d. SCOTLAND: 90/160%, 4s. to 5s.; 90/220%, 1s. 9d. to 2s. naked.

Intermediates and Dyes

p-CRESOL 34-5° C.—1s. 9d. per lb. in ton lots.

Pharmaceutical and Fine Chemicals

PARALDEHYDE.—1s. 1d. per lb. in demijohns.

Essential Oils

BOURBON GERANIUM.—23s. per lb.
CANANGA, Java.—8s. 6d. per lb.
CITRONELLA, CEYLON.—1s. 10d. per lb.
LAVENDER, MONT BLANC, 38/40%.—17s. per lb.
PALMA-ROSE.—7s. per lb.
PEPPERMINT, JAPANESE.—3s. 9d. per lb.
PETITGRAIN.—4s. 3d. per lb.
SANDALWOODD, 90/92% (Mysore).—19s. per lb.

From Week to Week

NOTICE WAS GIVEN in the "London Gazette" of December 15 of the voluntary winding up of the Grafton Chemical Co., Ltd. Mr. R. E. Brydon, 30 Brown Street, Manchester, has been appointed liquidator.

SANCTION WAS GIVEN in the Chancery Division on Tuesday to the reduction of capital of Southall Bros. and Barclay by cancelling 130,000 preference shares by paying holders their capital with a bonus of 25 per cent.

MR. GILBERT GILBEY, of Overthorpe Hall, Banbury, Oxon, deputy-chairman of the United Glass Bottle Manufacturers, Ltd., and a director of the British Association of Glass Bottle Manufacturers, Ltd., and Cannington, Shaw and Co., Ltd., who died on October 24, left £70,964.

IRISH FREE STATE IMPORTS during the month of October in respect of chemicals, drugs and similar goods, were valued at £77,943, as compared with £67,421 in the corresponding period of last year. Chemical fertilisers amounted to £25,659 in October, as compared with £26,824 in October of last year.

MR. JOHN BRYSON ORR, J.P., of 3 Whitehall Court, London, S.W.1, and of Crossacres, Woolton, Liverpool, founder of Orr's Zinc White, Ltd., of Widnes, who died on September 23 last, aged 93 years, left estate of the gross value of £111,844, with net personalty £109,811.

SIR HAL COLEBATCH, Agent General for Western Australia, addressed an Individualist Luncheon, at the Hotel Victoria, London, on December 13. He expressed his belief that England had not nearly reached her maximum of production, and that it still had enormous and undeveloped economic possibilities. Thanks were proposed by Mr. Kenneth Keymer, and seconded by Mr. Christopher Benn.

A RUNAWAY LORRY laden with chemical dyes which burst into flames near Penrith on its way from Glasgow to Manchester on December 14, was totally destroyed, although the Penrith Fire Brigade quickly arrived. The lorry got out of control as it was going down a steep hill. On the other side of a wall with which the lorry collided, was a drop of 20 ft. Thirty-two telegraph wires by the roadside were broken.

AT A CONGREGATION of the University of Birmingham held in the Great Hall at Edgbaston on December 15, and attended by the usual ceremonial, the Vice-Chancellor and Principal (Sir Charles Grant Robertson) conferred a number of degrees, the candidates being presented by the Deans of the faculties concerned. The degrees included: Doctor of Science.—N. P. Allen (metallurgy), A. R. Bowen (oil engineering and refining). Master of Science.—J. L. Howard (oil engineering and refining); H. Stevens (metallurgy), B. H. Wood (chemistry). Bachelor of Science.—E. B. Blyth (chemistry and zoology).

A LARGE INCREASE IN ORDERS is reported at the factory of the Scottish Dyes, Ltd. (Imperial Chemical Industries, Ltd.), at Grangemouth. Dr. W. G. Hiscock, works manager, stated that there was a probability that work in the factory would have to be carried out without cessation during the ordinary new year holidays. "We usually close down the first two days of the year," he said, "but this will not be possible owing to the pressure and a staff will have to be in attendance at the works all the time."

THE DEATH OCCURRED LAST WEEK at his residence, 31 Huntly Gardens, Glasgow, of Mr. Thomas Arthur Gallie, sole partner of the firm of Thomas H. Gallie and Co., West Indian and African merchants, 261 West George Street, Glasgow. Mr. Gallie, who was a director of a large number of rubber companies, was one of the pioneers in bringing about Glasgow's association with the rubber planting industry. He was a son of the late Mr. Thomas H. Gallie, founder of the firm. Mr. Gallie was born at Glasgow and was educated at Fettes College, going there in the second year after the opening of the College. He was the first Fettesian to send a son to Fettes College. Mr. Gallie, who had been in failing health for some time, was in his 77th year.

AN APPLICATION by the West Riding Rivers Board for consent to take legal proceedings against Charles Sheard and Sons, Ltd., rag and wool dyers, Carr Mills, Bradford Road, Birstall, for alleged offences under Section 4 of the Rivers Pollution Act, 1876, was the subject of a public inquiry held by Mr. F. Gregson Williams, an inspector of the Ministry of Health, at the Council Offices, Birstall, on Tuesday. According to the evidence, the existing purification plant was incapable of dealing with the increased volume of trade liquids produced since the company had extended its premises last May. For the company, it was stated that the prevailing trade conditions would not justify the expense of extending the purification plant, the cost of which was estimated at between £600 and £700. After hearing the evidence for and against the application, the Inspector closed the inquiry and intimated that he would report to the Ministry of Health.

MR. W. STAINSBY has resigned from the staff of G.V.D. Illuminators, Aldwych House, London.

MOUNT SHANNON MILLS, Inchicore, Dublin, have been acquired by Thomas Parsons and Sons, Ltd., where they will undertake the manufacture of their new enamel—"Parsonol"—and other paint products.

THE NOMINAL CAPITAL of R. H. Linton, Ltd., chemical manufacturers, etc., 100 High Holborn, W.C., has been increased by the addition of £2,000 in £1 ordinary shares beyond the registered capital of £1,500.

THE SPECIAL COMMITTEE of the French Chamber, which is studying the reorganisation of the importation and refining of petrol, has decided, by a large majority, to reject the State monopoly and control scheme.

DR. ANTONIN BASCH, who has for some years been head of the research department of the National Bank of Czechoslovakia, has been appointed a director of the Usti (Aussig) Chemical Union, the leading concern of its kind in Czechoslovakia.

THE CONSETT IRON CO. has put another furnace into blast. Fifty additional men have been given work, and during the past three months the company has found employment for over 1,000 men at its coke works and colliery.

THE ANGLO-AMERICAN CHEMICAL CO., LTD., has increased its nominal capital by the addition of £2,000 beyond the registered capital of £3,000. The additional capital is divided into 1,000 10 per cent. cumulative preference and 1,000 ordinary shares of £1 each.

IN AN EFFORT TO INCREASE security and regularity of flight on the State Air Lines in Czechoslovakia, the Ministry of Public Works is having tests made in which naphtha is being used as fuel in place of the easily inflammable benzine in order to minimise the danger of fire during flight or in case of a crash.

THE BECCO ENGINEERING AND CHEMICAL CO., LTD., has received orders for water-softening plants for the London and North Eastern Railway at Langley, Knebworth, and Stevenage, and the Mitchell Conveyor and Transporter Co., Ltd., orders for alterations to London and North Eastern Railway locomotive coaling plants at Doncaster and Whitemoor.

IN THE CHANCERY DIVISION on Tuesday, Mr. Justice Maugham had before him a petition by Central Provinces Manganese Ore, Co., Ltd., for the confirmation by the Court of the reduction of its capital from £1,000,000 to £500,000 by return of capital which is in excess of the wants of the company. Mr. Turner, for the company, said it had in hand £528,000 in cash and first-class securities worth over £200,000. His lordship confirmed the reduction.

INDUSTRIAL RESEARCH has undoubtedly been of great value to industry, said Mr. Kenneth Lee (chairman of Tootal Broadhurst Lee Co.), in the course of a lecture on "Industrial Research—A Business Man's View," given at the Royal Institution on December 15. Mr. Lee took as an example the cotton and artificial silk industry. He said it was only about 24 years ago that a nucleus of a scientific staff was formed. He outlined the difficulties they encountered, and which had to be overcome, and how, even after success had been won in the laboratory, the problem of applying the results obtained to large scale production was left. For success in the laboratory was often only half-way to the final goal.

AN EXTENSION to the pavilion at the recreation club of the Castner-Kellner Alkali Co., Ltd., (I.C.I.) at Weston Point, costing £3,500, was opened by Mr. E. O. Glover on December 9. The extension has permitted the accommodation of two additional billiard tables on the ground floor and an addition to the bar. On the upper floor, the extensions include ladies' dressing rooms and a lecture hall. The latter has been added in such a way that when necessity arises, it can be brought into use as one unit with the main hall. Mr. Glover was presented with a fruit bowl as a mark of appreciation of the members of the club. Of the sum required for the extension £3,200 was given by the directors and the remaining £300 was found from the club funds.

RAPID AND EXTENSIVE DEVELOPMENTS in the production of petrol by the hydrogenation of coal are promised by the great German Dye Trust. They will result, it is claimed, in the employment of 10,000 men and the erection of new plant and buildings. The German Government has been interested for some time in the possibility of making Germany partly independent of other countries for her fuel supplies, and there were recently negotiations with the Dye Trust, whose object was to obtain a guaranteed price over a number of years. The present annual consumption of motor spirit in Germany is 1,500,000 tons, of which 900,000 tons are imported. The Leuna works of the Dye Trust, whose present output is 120,000 tons, aims at an annual production of 400,000 tons.

A NEW COMPANY, Dae Health Laboratories (Irish Free State), Ltd., has recently been registered in Dublin for the purpose of carrying on the business of manufacturers of toilet preparations, soaps and powders.

THE UNITED MOLASSES CO., LTD., is to resume payment of of preference dividends on March 31, said Mr. F. K. Kielburg, presiding at the general meeting of the company on December 14. The improvement in the company's business had continued, and if it was maintained, profits for the year to September 30, 1934, should be sufficient to enable the company, after making adequate provision for depreciation, to pay for the service of the funded income stock, the interest on the income debenture stock, the preference dividend and a dividend on the ordinary shares. But Mr. Kilburg warned shareholders against exaggerated expectations. The payment of the funded income stock debt and the importance of building up substantial reserves must, for some years, restrict the amount it would be prudent to distribute as ordinary dividends. The company's reconstruction scheme was approved at subsequent meetings.

ONE OF THE LARGEST FACTORY REMOVALS ever undertaken is at present in progress on the L.N.E.R. and Southern Railway. Aveling and Porter and Barford and Perkins, Ltd., engineers, of Rochester, are removing the whole of their plant and manufacturing activities and 150 of their workmen, in addition to their scale and technical staff, to a new factory adjoining the L.N.E.R. main line at Grantham. Nearly 10,000 tons of machinery is being dismantled, loaded on to railway wagons, conveyed to Grantham and re-erected 120 miles away from its original home. The removal started in October, five or six trucks a day being dispatched, but work has now been accelerated and 30 wagons a day are now being loaded and despatched, and the works are expected to be operating at Grantham before the end of February.

MINING AND INDUSTRIAL EQUIPMENT, LTD., of 11 Southampton Row, London, W.C.1., have moved their offices to Aldwych House, Aldwych, London, W.C.2 (4th floor). Telephone No.: Holborn 2002.

SOMEWHAT ALARMING REPORTS of a fire which occurred at the factory of Howards and Sons, Ltd., Ilford, on Monday night appeared in the daily newspapers on Tuesday. Actually the fire was confined to a portion of the acid salicylic plant, and will not cause the slightest interference in the manufacture and delivery of Howards solvents which are used in the various textile, lacquer, varnish, paint, plastics, rubber, etc. trades.

DR. EDWARD R. WEIDLEIN, director of Mellon Institute of Industrial Research, Pittsburgh, announces that the Multiple Industrial Fellowship on Heating, sustained in the Institute since 1929 by the National Radiator Corporation, is continuing actively a number of investigations of interest to heating specialists as well as users of heating equipment. In addition, the Fellowship, whose incumbents are Dr. J. L. Young and Mr. A. C. Jephson, has been lately according more and more research attention to certain problems in air conditioning and also to the development of new products. After a thorough investigation of ferrous and non-ferrous heating units, the Fellowship has found that cast iron is the most suitable metal for the construction of finned convectors. Results of work on impregnated wood foundry patterns, now fully patented, are likewise of interest to heating industrialists. During the past three years the Fellowship has been engaged in the development of corrosion-resistant materials especially for use in the petroleum and other process industries, conducting this investigation in collaboration with the research department of teh National Radiator Corporation. During the course of these studies the findings of the International Nickel Co. respecting the place and utility of "Ni-Resist" have been

Company News

Reeves & Sons.—A dividend of 1½ per cent., less tax, is announced on the ordinary shares, payable on January 18.

Aberthaw & Bristol Channel Cement.—It is announced that no interim will be paid on the ordinary shares.

Yorkshire Dyeware and Chemical Co.—A dividend of 2½ per cent., less tax, is payable on January 1.

W. and T. Avery, Ltd.—The company, it is announced, will, on January 1, redeem the whole of the 4½ per cent. debenture stock outstanding at 101½ per cent.

Tarmac, Ltd.—The payment will be made on January 1 of the dividend on the 5½ per cent. cumulative preference shares, in respect of the half-year ending December 31, 1933.

Bleachers' Association.—It is announced that no interim payment will be made on the ordinary stock in respect of the year to March 31, 1934.

Transparent Paper Co.—The accounts for the year ended September 30 last, show a trading profit of £12,638, from which has to be deducted bank interest and legal and directors' fees, leaving a net profit of £7,111. The annual meeting will be held at Southern House, Cannon Street, London, on December 28, at 3 p.m.

Acetex Safety Glass Co.—There was a loss to June 30 last of £12,721. This includes £1,356 to depreciation of plant, etc., writing down stock by £2,171, expenses of patent actions £296 alterations to factory £260, and costs of investigations £1,330. The trading loss was £7,306.

Bussey Coal Distillation and Bussey International.—The joint report shows a loss for the year to June 30 of Bussey Coal Distillation of £2,004, which increases the debit brought in to £218,975, and of Bussey International a loss of £834, making debit brought in £12,812.

Cyprus and General Asbestos Co.—The accounts for the year ended June 30, 1933, show that operation before allowing for depreciation on fixed assets, resulted in a loss of £5,403, which, added to debit to profit and loss brought forward, makes a total debit of £8,638. The annual meeting will be held in Amiandos-on-Troodos, on December 30.

British Benzol and Coal Distillation Co.—The accounts for the year to October 31, 1933, state that the trading results show a profit of £4,692, compared with a loss of £5,393 for the preceding year. After overhead expenses, bank and debenture interest, etc., and allowing £9,680 for depreciation, the loss for the year is £13,932. This, with the debit balance brought forward, makes a total debit on profit and loss of £79,516.

Egyptian Salt and Soda Co.—For the year ended August 31, 1933, the report states that the gross profits, including interest on investments, were £E.69,121. After deducting administration expenses, interest on debentures, amount transferred to reserve for bad and doubtful debts, depreciation on factories, etc., the net profits are £E.49,845, to which is added the amount brought forward £E.859, making £E.50,704. It is proposed to distribute a dividend of 10 per cent., the same as in the previous year, carrying forward £E.2,169.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Australia.—A firm of manufacturers' agents in Melbourne desire to secure the representation of United Kingdom manufacturers of industrial chemicals and dyes, pigments, tanners' requisites, on a commission basis, for Victoria, or through sub-agents for the whole of the Commonwealth. (Ref. No. 682.)

New Zealand.—H.M. Trade Commissioner at Wellington reports that a local firm of general merchants desires to be placed in touch with United Kingdom manufacturers of mineral and vegetable oils, chemicals, Epsom and glauber salts, pigments and metal tubes for tooth pastes, etc. (Ref. B.Y. 7722.)

South Africa and Southern Rhodesia.—A firm of agents in Johannesburg, the partners in which are qualified chemists, desires to obtain the representation of manufacturers of heavy and mining chemicals, scientific apparatus, laboratory ware, chemists' sundries, oils, turpentine and dyes for the Union of South Africa and Southern Rhodesia. (Ref. No. 689.)

Belgium.—A commission agent and manufacturers' representative established at Antwerp is desirous of obtaining the representation of British manufacturers of food preparing machinery; machinery for the chemical and pharmaceutical industries; aluminium foil, on a commission basis. (Ref. No. 693.)

Bulgaria.—A firm in Sofia is desirous of representing United Kingdom manufacturers of chemicals for soap-making trade, on a commission basis. (Ref. No. 696.)

United States of America.—H.M. Consul-General at New York reports that a local firm desires to be placed in touch with the United Kingdom exporters of linseed oil. (Ref. B.Y. 7720.)

New Companies Registered

Ronuk (Ireland), Ltd. Registered in Dublin on December 13. Nominal capital £5,000. Manufacturers of and dealers in polishes, varnishes, dyes, powder, disinfectants, paints, pigments, turpentine, wax, etc. A subscriber: Niall McLoughlin 27 Eglington Road, Donnybrook, Dublin.

Colloidal Colours, Ltd. Registered December 13. Nominal capital £360. To acquire the right to use and work a secret process relating to the manufacture of colloidal colours, being a chemical process for the colouring of certain articles, materials and subjects, and to carry on the business of manufacturers of and dealers in colloidal and other colours suitable for use in colouring slates, tiles, slate dust and granules, cement, concrete, brickwork, etc. Directors: Martyn I. Williams-Ellis, Plas Wrenydd, Blaenau Festiniog, John S. Matthews, John G. Wynne-Williams, Hadleigh S. Seaborne.